IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XXVII FEBRUARY 1948

WILSON (J. D.). **Airplane dusting in the control of Tomato diseases.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxxii, 246, pp. 91–95, 1 fig., 1947.

During 1940 in the Toledo area of Ohio a comparison was made of the efficacy of fixed copper dusts applied by ground dusters and by aeroplanes in the control of tomato diseases [*R.A.M.*, xxvi, p. 471], notably early blight (*Alternaria solani*) and leaf spot (*Septoria lycopersici*]). In an average of two such experiments there was an increase in tomato yield over the untreated controls of 1·44 tons per acre after aeroplane dusting and 3·83 after ground dusting. The much greater increase in the yield of green fruit following ground dusting showed that this method was more effective than the other in controlling leaf diseases.

In trials in seven different areas in which fixed copper dusts were applied by aeroplane the average total yield obtained was 19·05 tons per acre against 15·57 from the untreated fields. The average increase in saleable fruit was approximately 2 tons per acre, the percentage of ripe fruit rendered unfit for use was reduced from 38 to 29 per cent., and there was a considerable degree of control of foliage diseases as the quantity of green fruit remaining on the vines after picking was increased by 2 tons per acre. Four of the seven fields showed a profit from the dusting programme but two did not show a profitable return.

HARRISON (A. L.). **The relation of weather to epiphytotics of late blight on Tomatoes.**—*Phytopathology*, xxxvii, 8, pp. 533–538, 1 graph, 1947.

An exceptionally severe and widespread outbreak of late blight (*Phytophthora infestans*) is reported on tomatoes [*R.A.M.*, xxvi, p. 570] from the west coast of Florida, where many entire beds containing hundreds of thousands of plants were completely destroyed at a very early stage of growth. First detected on 26th November, 1945, the disease assumed a destructive form in the seed-beds in mid-January with another peak about the 22nd, remained quiescent until the end of February, broke out with renewed virulence in the first week of March and again about the 19th, and culminated in a final attack in mid-April at the height of the harvest season, resulting in heavy financial losses to local growers. Long periods of high humidity were more important than rainfall in the spread and development of late blight, which was relatively inactive unless 100 per cent. relative humidity prevailed for more than 15 hours [cf. ibid., xiv, p. 391]. It was clear from observations made during these outbreaks that *P. infestans* spores can be conveyed 30 to 40 miles by the wind under favourable meteorological conditions [cf. ibid., xxv, p. 352].

NICHOLAS (D. J. D.) & STANTON (W. R.). **Experiments on the control of magnesium deficiency in glasshouse Tomatoes. IV. Concluding report.**—*Rep. agric. hort. Res. Sta. Bristol, 1946*, pp. 66–79, 1947.

This paper describes the concluding tests made at four centres on the alleviation of magnesium deficiency in tomato [*R.A.M.*, xxv, p. 586]. For this purpose a

minimum of 10 cwt. per acre magnesium sulphate (30 per cent. magnesium oxide) is required, but better results are obtained using 20 cwt. Again the most effective control measure was a 2 per cent. foliage spray [ibid., xxvi, p. 185] applied five times at two- to three-week intervals starting at the early stage of the growth. Trial tests are recommended before each application. The addition of a 2 per cent. magnesium sulphate to the routine fungicide spray, e.g., shirlan AG (1 fluid oz. per gal.), showed the same good results. A 0·5 percentage of magnesium oxide in the mid-stem leaves can be taken as a rough minimum content.

Hansbrough (J. R). & Stout (D. C.). **Virus-like symptoms accompanying Birch die-back.**—*Plant Dis. Reptr*, xxxi, 9, p. 327, 1947. [Mimeographed.]

An examination made during 1947 of birch trees in Maine, which is well within the New England die-back area [*R.A.M.*, xxvi, p. 516], revealed the presence of certain abnormalities frequently associated with virus diseases, such as reduction in leaf size, cupping of leaves, curling of foliar and flowering parts, and development of adventitious buds and twisted branches. Vein-clearing was prominent on both white [*Betula papyrifera*] and yellow [*B. lutea*] birch leaves and broom-like growth was observed on *B. papyrifera* stump sprouts. Transmission of the disease by grafting is being attempted.

Pomerleau (R.). **Means of inoculation of the Dutch Elm disease by Hylurgopinus rufipes Eichh.**—*Canad. J. Res.*, Sect. C, xxv, 3, pp. 102–104, 1 pl., 1947.

The results of this investigation indicate clearly that the sole vector of Dutch elm disease (*Ceratostomella ulmi*) in eastern Canada [*R.A.M.*, xxvi, p. 430], *Hylurgopinus rufipes*, readily inoculates healthy elms with the disease. Since 1945, felled infected trees have been examined in order to find feeding injuries produced by *H. rufipes* on twigs, but no scars similar to those made by *Scolytus multistriatus* in the United States were found and the bark of the trunk or large limbs showed no tunnels chewed inward from the over-wintering cell to the cambium before emergence. Thirty young elms, showing the first symptoms of the disease when felled, were found to bear characteristic brown streaks with inoculum on the sapwood of twigs or limbs less than 2 mm. in diameter, and connected by tunnels dug by the insect (adult beetles were often present). The shallow puncture on the sapwood of about 1 mm. diameter was usually surrounded by a dark, oval spot, 4 to 10 by 3 to 5 mm. Sometimes, during the first stage of the vascular infection, only small, faint, brownish discoloration appears around the bite. The insect can penetrate more easily the thin bark of young branches and leave the spores in the living xylem than the thick bark of older trees. Cultures from all the examined trees yielded *C. ulmi*.

Walter (J. M.). **Canker stain of Planetrees.**—*Yearb. Agric. U.S. Dep. Agric., 1943–1947*, pp. 481–484, 1947.

The species of *Endoconidiophora* [allied to *Ceratostomella fimbriata*] causing canker stain of London plane (*Platanus acerifolia*) in the United States [*R.A.M.*, xxiv, p. 39; xxvi, p. 85] also occurs occasionally on *P. occidentalis* in remote stands in the Appalachians. Spread is due almost entirely to human agency, tests of dissemination by wind and rain resulting in no case of infection more than 25 ft. from the source. The causal organism is spread readily in pruning operations and by other mechanical means, but pruning tools are less important in this respect than the commonly used forms of asphalt wound dressing.

Where the disease is already established, it is important to avoid all unnecessary mutilation of plane trees. All diseased trees and parts of trees should be removed. Once infection has developed in the trunk, the tree is doomed, but it does not usually

succumb for three years or more. Pruning should be confined as far as possible to the period 1st December to 15th February [cf. loc. cit.].

To prevent the introduction of the disease into new areas, all equipment should be disinfected before any work is begun on plane trees and any wound dressing used should be fortified with phenylmercury nitrate or be taken from a previously unopened container and used with new tools.

Boggess (W. R.) & Newman (R. R.). **Occurrence of little leaf disease of Pine and its effects on forestry in Alabama.**—*Circ. Ala. agric. Exp. Sta.* 94, 11 pp., 1 map, 1947.

Serious losses of pines due to the little leaf disease [*R.A.M.*, xxiv, p. 296] are threatened in the northern half of Alabama, where in certain districts as much as 30 per cent. of timber volume is affected. The 1941 survey reported little leaf disease on 30 different soils in the Piedmont and Upper Coastal Plain areas. It attacks trees when they are about 20 years old, and is more common in the dominant and co-dominant trees than in the smaller trees of a stand. A survey of the Piedmont area in 1946 showed 29 per cent. of pine volume to be affected. The total pine sawtimber had been reduced by about 47 per cent. since 1941, that of shortleaf pine [*Pinus echinata*] from 422 board ft. in 1941 to 253 in 1946, and that of loblolly pine [*P. taeda*] from 550 to 298. Cordwood volume has been affected to a lesser degree. The increase of the disease by 6 per cent. since 1941 was about the same as for shortleaf and loblolly pine. In two stands at the Experiment Forest Unit in Coosa County about 15 trees per acre became infected over a five-year period.

Diseased stands should be cut every three to five years to salvage newly affected pines as the trees usually die within five to seven years after showing symptoms of little leaf. Under a suggested short rotation plan, shortleaf pine would be removed as it reaches the size and age when it is susceptible. Cultivation of slash pine [*P. caribaea*] on which little leaf has not yet been found, and loblolly pine, which shows more resistance than the other pines, is recommended.

Lewis (W. E.). **The preservative treatment of poles and timber.**—*Quart. J. Nyasald Agric.*, vi, 4, pp. 81–93, 1946. [Received September, 1947.]

In this comprehensive paper the growing importance of methods of preserving timber and wood products [*R.A.M.*, xxvi, p. 518] generally is discussed. A list, with the botanical and vernacular names, is given of the principal Nyasaland soft- and hardwoods which are naturally resistant to fungal decay and termite attack. The factors to be considered when selecting a preservative are presented and notes given on the toxic oils, water-soluble poisons, and poisons soluble in liquids other than water, which can be used as preservatives. The open-tank and the full- and empty-cell pressure processes [ibid., xxvi, p. 88] of impregnation and a simple method for preserving poles and timber in Nyasaland are described. The last is a simple tank heat treatment, using a concentrated cattle dip solution. A note is appended on the efficacy of impregnating bamboos by standing the ends of the freshly cut shoots in preservative.

Holmes (C. H.). **Prevention and control of insect borers and fungal stains and decay of the timber of Malaboda (Myristica dactyloides Gaerth).**—*Indian For.*, lxxiii, 3, pp. 107–117, 1947.

This study deals with the prevention of damage by seven species of insect borer and fungal decay, caused mainly by *Polystictus ostreiformis* Berk. (identified by L. S. Bertus) in malaboda (*Myristica dactyloides*) trees in Ceylon. Left under forest conditions all logs decayed to such an extent within six months that they became completely useless, no matter how treated. They remained free from borers or

fungal decay as long as they were immersed in water. When removed they became badly affected, even after six months in water.

Decay and borer infestation in sawn timber can be prevented by brush coating with or momentary steeping in any of the following materials: lime wash, 10 per cent. hot aqueous borax solution, cold aqueous ascu solution [*R.A.M.*, xxi, p. 399] ($\frac{1}{4}$ lb. per gal.), 5 per cent. aqueous sodium silicofluoride, 1 per cent. aqueous suspension of gammexane P.C. 1147, 2 per cent. petrol solution of gammexane P.C. 982, and 1 per cent. petrol solution of D.D.T. The preservatives must be applied immediately after felling and sawing. Tea chests made of wood treated with either borax or sodium silicofluoride were found to be adequately protected after transport and $6\frac{1}{2}$ to $7\frac{1}{2}$ months' storage.

Cartwright (K. St. G.) & Findlay (W. P. K.). **Decay of timber and its prevention.**—vi+294 pp., 49 pl., 5 figs., 3 graphs, London, H.M. Stationery Office, 1946. 12*s.* 6*d.* net.

In this work the authors present, with much new information, the descriptions already published by them of the principal decays affecting oak, softwoods, and British hardwoods [*R.A.M.*, xvi, p. 3; xviii, p. 361; xxii, p. 2]. After an introduction dealing with the economic aspects and history of the subject, chapters are devoted to the causes of decay; the technique of examining decayed wood; the physiology of wood-destroying fungi; the effects of fungal decay on wood; principal decays of standing trees in Great Britain; rots of felled timber and timber in service in the open; rots of timber in buildings and structures; prevention of decay in felled and converted timber during storage and transit; decay of timber in buildings, mines, vehicles, aircraft, ships, poles, fences, and horticultural use; deterioration of composite wood and manufactured wood products; natural durability of timber; chemical preservation; and fungal staining. The British Standard method of test for the toxicity of wood preservatives (the wood block test) is described in an appendix, and there is a useful index.

Hartley (C.). **Fungi in forest products.**—*Yearb. Agric. U.S. Dep. Agric., 1943–1947*, pp. 883–889, 1947.

The author discusses various precautions against failure of wood in service from fungal decay, e.g., the use of seasoned timber (only) for building, the use of decay-resistant species and of wood from trees of certain ages and from certain parts of trees, the selection of glueing materials showing resistance to fungal attack [*R.A.M.*, xxvi, p. 179], the effect of paint in relation to decay, and the prevention of decay in the wooden parts of houses and barracks built close to the ground and without basements.

Gutzevitch (S. A.). Болезни Картофеля и овощных культур. [Diseases of Potatoes and vegetable crops.]—73 pp., 36 figs., Leningrad, Press and Book Publishing Office, 1944. Price r. 2.50. [Received January, 1947.]

This booklet gives a popular account of the chief potato and vegetable diseases occurring in the Leningrad district of the U.S.S.R. For each disease the symptoms and control measures are described. The book contains chapters on the diseases of potato (fungal, bacterial, and virus), cabbage, tomato, beet, cucumber, onion, and carrot.

Staniland (L. N.). **Hot-water treatment of plants.**—*J. Minist. Agric.*, liv, 6, pp. 278–282, 1 diag., 1947.

A simple, home-made bath for the hot-water treatment of plants, costing about £11, consists of a circular, galvanized, heat-lagged dustbin or corrugated iron tank, 30 in. diam. by 36 in. deep, mounted on a three- or four-legged iron stand or on

bricks, and heated by an ordinary oil stove or gas ring. Carpet underfelt and asbestos cement can be used for lagging. The plants are arranged in about six wooden, wire-mesh sieves of about 26 in. diam., clamped together so that each forms a lid for the one below, the pile standing 3 in. off the bottom of the bath. An accurate thermometer 12 in. long and reading from 105° to 120° F., is pushed through a piece of cork so that the latter floats on the surface and the bulb is among the plants. It is unnecessary for the container to be covered with a lid, the bath being placed in a draught-free position. There should be about 2 in. of water above the loaded sieves, and the temperature should be kept constant at 110°.

Mint rust [*Puccinia menthae*: *R.A.M.*, xxv, p. 232] can be completely controlled if the runners are treated when they are lifted prior to forcing. They should be thoroughly washed in cold water, lowered into the bath (heated to 112°, to allow for the drop to 110°) for ten minutes, and then plunged into cold water. They should be planted more widely spaced than usual as the growth of treated runners is very luxuriant. Care should be taken that all utensils used are sterilized, that the bath location is scrupulously clean, and that the runners are planted in clean soil.

Porter (R. H.). **Germinability of treated and untreated lots of vegetable seed in Pythium-infested soil and in the field.**—*Bull. Ia agric. Exp. Sta.* 345, pp. 949–983, 1 fig., 1946. [Received October, 1947.]

Seed lots of beans [*Phaseolus lunatus* and *P. vulgaris*], beet, carrots, onions, peas, popcorn and sweet corn [maize], soy-bean, spinach, and tomatoes were tested by the standard seed-testing methods. Untreated seeds showed poor germination at approximately 10° C. in field soil mixed with two parts of sand and naturally infested with *Pythium debaryanum* and *P. graminicola*. Beans and peas were exposed to this temperature for three days, beets, carrots, onions, and tomatoes for five, maize and soy-beans for seven, and spinach for 21 days, after which they were removed to the nearly optimum temperature for the germination of the particular kind of seed. A moisture content of about 15 per cent. was used as standard as the emergence percentage decreased and the damping-off increased with higher humidity.

The emergence percentage of untreated seed grown under these conditions was nearly always lower, sometimes 30, 50, and 70 per cent. less than that of seed grown in sand at the optimum temperature. The value obtained was taken to indicate the relative susceptibility or resistance of a given seed lot to infection by the soil organisms that cause seed decay and pre-emergence blight of seedlings. The growth of treated seeds under the same conditions provided a valuable index of the protection given by fungicides to the seed, and the emergence of all seeds in the cold soil medium gave a good indication of field response likely under conditions unfavourable to germination.

All seed treated with arasan gave excellent results. Spergon was nearly equal to arasan for peas, maize, soy-beans, and onions. Under favourable germination conditions semesan was nearly as effective as arasan and spergon for maize and soy-beans. Unfavourable conditions for germination (temperature, moisture) necessitate a higher rate of application of both arasan and spergon.

Soy-beans two years old showed a much lower percentage of emergence than one-year-old seed of the same germinability when grown in *Pythium*-infested soil.

Tisdale (W. B.), Brooks (A. N.), & Townsend (G. R.). **Dust treatments for vegetable seed.**—*Bull. Fla agric. Exp. Sta.* 413, 32 pp., 1 fig., 1945. [Received September, 1947.]

This paper contains the results of five years' experiments (not yet completed) with seed treatments most efficacious in preventing seed decay of the principal

vegetable crops in Florida [*R.A.M.*, xxvi, p. 146]. Spergon is one of the best and safest materials for Fordhook Lima beans [*Phaseolus lunatus*: ibid., xxvi, p. 274] at dosages from 0·25 to 0·4 per cent. Arasan (0·125) also gave significant increases in stand. For beet 0·5 per cent. arasan is recommended. Arasan (0·25) and semesan (0·35) were the best protectants for Brussels sprouts and cabbage, arasan giving the best protection against *Rhizoctonia* [*Corticium solani*: ibid., xxv, p. 379] and *Pythium* [ibid., xxvi, pp. 139, 378]. Arasan (0·125) and semesan (0·3) are recommended for cucumber seed.

In autumn and spring tests seed germination of eggplants was markedly increased by zinc oxide treatment at 0·5 or 1 per cent. Germination of old snap bean [*Phaseolus vulgaris*] seed of low viability or that of varieties susceptible to pre-emergence damping-off was improved by spergon (0·25) or arasan (0·125) treatment. Post-emergence damping-off was not reduced by any treatment. The best results for English pea, in descending order of efficacy, were given by spergon (0·25), arasan (0·25), cuprocide (0·5), and semesan (0·25). Zinc oxide (0·25 to 0·5) gave the best results with [chilli] pepper.

On Norfolk sandy loam and Leon soils spinach seed showed significant increases in germination when treated with 1 per cent. cuprocide; at 0·5 and 1 per cent. it proved very effective on Bladen sandy loam infested with *Pythium irregulare* and *C. solani* [ibid., xxvi, p. 146]. In early spring 2 per cent. semesan markedly increased germination in Leon and Norfolk sandy loam and no signs of injury were observed. At higher temperatures in autumn dosages of 0·5, 1, and 2 per cent. caused decreases in germination in the Norfolk soil. Spergon (0·5 and 0·75), 2 per cent. phenyl mercury acetate, and 4 per cent. phenyl mercury chloride (both at 0·5) were also effective and safe for spinach seed treatment. Zinc oxide (1 or 2 per cent.) reduces decay of spinach seed under certain conditions, but is not always as effective as the other materials.

Arasan at 0·13 per cent. improved germination of sweet corn [maize] seed of low viability and slow germination. Zinc oxide and spergon both at 0·5 are recommended for tomato seed treatment. The paper concludes with details of seed treatment methods and a tabulated summary of the recommended dosages.

Sylvester (E. S.). **Influence of fasting in the transmission of the Beet mosaic virus by the green peach aphid.**—*Phytopathology*, xxxvii, 7, pp. 528–530, 1947.

Replicated experiments were undertaken at Berkeley, California, to substantiate the observations of Watson *et al.* in England as to the favourable effect of fasting on the efficiency of the green peach aphid [*Myzus persicae*] in the transmission of the beet mosaic virus [*R.A.M.*, xxv, p. 245]. Wingless females from a non-infective colony established on a sugar beet in the greenhouse were starved in a vial for periods of two to four hours, after which five single aphids were each fed on a single virus source for half, one, and two minutes, and then placed singly on healthy seedlings for a 24-hour feeding period. Similar tests were made with single females from the same colony which were not starved prior to feeding.

The total number of infections obtained under the influence of fasting for the two longer periods was 13 out of 75, as compared with 3 out of 75 for the non-starved aphids. The increase in the former series is regarded as significant and furnishing additional evidence in confirmation of Watson's studies on the henbane mosaic [ibid., xix, p. 230] and other non-persistent viruses.

Myers (Amy). **'Hollow heart': an abnormal condition of the cotyledons of Pisum sativum L.**—*J. Aust. Inst. agric. Sci.*, xiii, 1–2, pp. 76–77, 1 fig., 1947.

Samples of garden and canning pea seeds from many parts of Australia, especially New South Wales, from New Zealand, and the United States showed an abnormal condition of the cotyledons [due to an undetermined cause] called 'hollow heart'.

A cracked or sunken area occurs in the centre of the adaxial surface of the cotyledon, with occasionally discoloration and necrosis. The seed appears normal externally and germinates well, but the 'hollow heart' seedlings yielded plants of significantly lower weight than did the healthy ones. The percentage of affected seed varies, 30 to 40 per cent. being quite common; up to 60 per cent. has been noticed.

LUTTRELL (E. S.). **Diaporthe phaseolorum var. sojae on crop plants.**—*Phytopathology*, xxxvii, 7, pp. 445–465, 2 figs., 1947.

Diaporthe phaseolorum has been shown by inoculations at the Georgia Agricultural Experiment Station [*R.A.M.*, xxv, p. 332] to be limited to Lima bean [*Phaseolus lunatus*], the host on which it was originally described by Harter (*J. agric. Res.*, xi, pp. 473–504, 1917): subsequent reports of its occurrence on tomato, [chilli] pepper, and snap bean [*P. vulgaris*] must therefore be regarded as unconfirmed.

The hosts of *D. phaseolorum* var. *sojae* [*R.A.M.*, xiii, p. 270] in the State comprise soy-bean, snap and Lima beans, cowpea, groundnut, lupin, *Lespedeza*, *Strophostyles helvola* [*Phaseolus helvolus*], tomato, chilli, okra [*Hibiscus esculentus*], onion, and garlic. Entering through the lesions of blossom-end rot or sunscald spots, the fungus is capable of causing a rot of chilli and tomato fruits, but no evidence was obtained of its pathogenicity to any other host. However, rapidly fructifying as a vigorous saprophyte on plants killed by other organisms or adverse environmental conditions, *D. phaseolorum* var. *sojae* might cause crop losses through seed decay, e.g., in beans and cowpeas, though such does not appear to be the case in Georgia.

D. phaseolorum var. *sojae* differs from *D. phaseolorum* mainly in pathogenicity and in the production in culture of pycnidia, and in some strains perithecia, in conspicuous diatrypoid stromata. The stylospores of the former are much smaller (mean 14·3 by 1·3 μ on the host and 15·8 by 1·3 μ in culture) than those of the latter (21·4 by 1·4 and 34·1 by 1·5 μ, respectively), but they are so rarely encountered in the field that the distinction is of little practical importance. On the host the ascospores of *D. p.* var. *sojae* are rather larger (11·1 by 3·7 μ) and the pycnidiospores slightly smaller (7·3 by 2·7 μ) than those of *D. phaseolorum* (9·5 by 2·9 and 8·6 by 3·1 μ, respectively). The latter species forms no perithecia in culture but it does produce pycnidiospores which measure 7·9 by 3·1 μ, while the ascospore dimensions of the former are 10·2 by 3·4 μ and its pycnidiospores 6·6 by 2·7 and 6·4 by 2·3 μ in the perithecial and non-perithecial strains, respectively. In agreement with Wehmeyer [loc. cit.], the author finds these morphological differences insufficient to justify the specific rank (*D. sojae*) formerly assigned to the soy-bean pathogen.

Of 45 isolates of *D. p.* var. *sojae* obtained from various hosts in Georgia, 21 were perithecial, i.e., they produce pycnidiospores, stylospores, and perithecia and tend to form echinulate stromata. The remainder were non-perithecial, giving rise neither to stylospores nor perithecia and inclining to the formation of smooth or botryose stromata: pycnidial production is often sparse. The individual isolates within each strain were observed to vary in stromatal size and shape, in fertility, and in general appearance.

MILLER (J. J.), HILDEBRAND (A. A.), & KOCH (L. W.). **Macrophomina and Fusarium attacking field Beans in Ontario.**—*Sci. Agric.*, xxvii, 6, pp. 251–259, 3 figs., 1947.

During 1945, sclerotia of *Macrophomina phaseoli* [*R.A.M.*, xxv, p. 56; xxvi, p. 435] were found on field beans (*Phaseolus vulgaris*) in Canada after a period of unusually warm weather, the first record on this host in the Dominion. In most cases a *Fusarium* was also isolated from the plants, its presence being correlated usually with a pinkish discoloration of the xylem. The longitudinal shredding of the outer tissues of the stem at ground-level and the presence of abundant small

sclerotia in the tissues were characteristic of *M. phaseoli* alone. The isolates of the two pathogens were found to include a number of morphologic strains. Greenhouse soil-inoculation, temperature experiments with two strains of each pathogen showed that the general trend in both fungi was towards an increase in disease incidence in Michelite beans with higher temperatures (e.g., 35° C.). This was also apparent when the pathogens were mixed. Both strains of *M. phaseoli* were equally virulent in this experiment but in another, in June, 1946, employing these and four additional strains, one of the latter caused a more rapid kill than the others. One particularly virulent strain of *Fusarium* (F–b) caused pre-emergent losses which became more severe at the higher temperatures. When inoculations with the two pathogens together were given, mortality was no greater than that caused by single infection with the more virulent of the two strains.

Zaumeyer (W. J.). **Control of Bean diseases.**—*Yearb. Agric. U.S. Dep. Agric., 1943–1947*, pp. 333–337, 1947.

Pioneer snap bean [*Phaseolus vulgaris*], released to growers in 1943, resists curly top [beet curly top virus: *R.A.M.*, xxii, pp. 86, 125; xxv, p. 592; xxvi, p. 275] and common bean mosaic [ibid., xxv, p. 484; xxvi, p. 180]. Florida Belle, a snap bean adapted to the South, especially Florida, and also introduced in 1943, resists rust [*Uromyces appendiculatus*], powdery mildew [*Erysiphe polygoni*: ibid., xxiii, p. 182; xxv, p. 225], and common bean mosaic. Logan, another snap bean, withstands powdery mildew and common bean mosaic. Florida White Wax is resistant to mildew, common bean mosaic, and some forms of rust, while Cooper Wax, a market-garden type, resists common bean mosaic and tolerates powdery mildew. Ashley Wax, a canning type, resists common bean mosaic and tolerates powdery mildew.

Ogilvie (L.) & Munro (M[oira D.]). **Chocolate spot of field Beans in the South West.**—*Rep. agric. hort. Res. Sta. Bristol, 1946*, pp. 95–100, [? 1947].

Of 32 isolations made from broad bean leaves affected with chocolate spot [*R.A.M.*, xxvi, p. 523], only four, originating from Somerset, belonged to the small-spored large sclerotial form, *Botrytis cinerea*, while the others were identified as *B. fabae* which has large spores and small sclerotia. The hyphae of *B. fabae* are deep brown, granular, and 12·7 μ wide. The ovoid, yellowish conidia are borne on minute sterigmata at the slightly swollen ends of branched conidiophores, have well-marked sterigma scars, and measure 13 to 22 by 10 to 16 μ, the sclerotia being 1 to 3 mm. in diameter.

In testing the pathogenicity of both species the best results were obtained when the beans were grown with low potassium and phosphate. Broad and tick bean plants grown in sand and sprayed with spore suspensions of *B. fabae* and *B. cinerea* developed small pin-point lesions, which later turned into typical chocolate spots. *B. fabae* caused lesions more readily and also induced reddish streaks on the stems.

Affected seeds planted in sterilized soil under very humid conditions gave a few infected shoots which produced abundant spores of *B. fabae*. Infected shoots have been found in the field in late autumn, but as the diseased plants often recovered, it is considered that the disease is not readily carried over to the next year by this means. Infected seeds treated with organo-mercury dressings showed no improvement in germination. Debris from infected crops, thought to be an important source of infection, was collected in the autumn of 1945 and stored both out of doors and indoors. Incubated under humid conditions in spring it developed numerous spores.

The 'aggressive' symptoms of the disease [ibid., xvi, p. 723] occur usually after early May rains. Sheltered valley fields in low-lying areas, such as the western parts of Somerset, are especially liable to chocolate spot. The disease is most severe in very early (late autumn) sowings [ibid., xxiii, p. 467]. Beans growing in

dredge corn (oats and barley) are comparatively unaffected. The necrotic parts of plants suffering from potash deficiency are readily infected by *B. fabae* and chemical tissue tests showed that potash-deficient plants are more susceptible than normal ones. Plants which received 1¼ cwt. muriate of potash were much less affected than those receiving ½ cwt. The marked connexion between phosphate deficiency and chocolate spot, already noted [ibid., xxiii, p. 422], has been confirmed by soil analyses, tissue tests, and inoculations. Generally where nutrition was normal the disease was epidemic in only a few early sown, low-lying fields.

At Cannington, in July, 1944, plants previously sprayed with Bordeaux mixture were 3 ft. 3 in. and had 15 pods, while the unsprayed were 2 ft. 3 in. with 13 pods. In June, 1942, about half the flowers and developing pods were killed by *Botrytis* at the Cannington Farm Institute; about 20 per cent. were destroyed in fields more exposed to the wind. In June, 1943, several hundred acres in Somerset were ploughed under as useless, and a 60 per cent. reduction of the bean yield was reported from Gloucestershire and Somerset, resulting from potash deficiency, chocolate spot, and rust [*Uromyces fabae*]. It is suggested that fields situated on slopes and exposed to wind should be selected for beans; where this is impossible, alleyways should be made through the fields in the direction of the wind, to promote rapid drying after rain. Plants should be adequately supplied with phosphate and potassium.

Bondartzev (A. S.). Гибель семенников Моркови под влиянием **Sclerotinia libertiana Fuck.** [Loss of Carrots grown for seed under the influence of *Sclerotinia libertiana* Fuck.]—*Volume of Scientific Works, U.S.S.R. Acad. Sci., Leningrad, 1941–1943*, pp. 379–381, 3 figs., 1946.

This study describes an attack of white rot of carrots (*Sclerotinia libertiana*) [*S. sclerotiorum*: *R.A.M.*, xxvi, p. 201] in 1943 on two State farms in the neighbourhood of Leningrad. Before planting, the carrots at both farms were kept in glasshouses under the same conditions, and those showing any signs of rot were destroyed.

A specially severe attack of white rot occurred on the Nant variety on one of the farms. The carrots were planted out from 15th to 20th May in very richly manured soil. After a few days, some of the plants turned yellow, wilted, and died. On 28th July, the diseased plants could be easily removed from the soil, usually with the remains of the main root. The bases of the leaf stalks were dark, with a slight or severe, odourless rot; the main roots showed blackened, rotted, partly macerated sections with light reddish-orange pith, and sclerotia, 7 to 16 by 5 to 10 mm., in the root cavities. Of 12,000 plants only 400 remained healthy. The author suggests that infection originated in the glasshouse where some white rot was present and the selection of evidently healthy carrots was not a sufficient control measure.

At the other farm planting (var. Gerand) took place between 10th and 15th May in light clay soil manured the previous year. Growth at first was poor and irregular and superphosphate and potassium salts were added to the soil. The weak plants were transplanted to a separate plot; 30 to 35 per cent. of these were diseased on 30th July, whereas the other plot showed only 15 per cent. infection. Localized softening of the external tissues was observed and the rot was almost like dry rot. The rootlets were well developed and the disease was not serious.

The author concludes that the differences in the composition of the soils were responsible for the variation in the severity of the disease.

Stuart (G. M.). **The Shallot.**—*Scot. J. Agric.*, xxvii, 2, pp. 92–95, 1947.

The yellow dwarf virus disease of shallot [onion yellow dwarf virus: *R.A.M.*, xxv, p. 485], which is widely distributed throughout Europe and America, has caused

serious economic losses in Scotland, where it was first recognized in 1940. Deterioration of the infected plants becomes more marked each season. Drake's experiments [ibid., xiii, p. 146] showed that more than 75 species of aphids could transmit the disease to healthy plants. The control measures recommended are the fumigation of the 'cloves' by cyanogas before planting, the removal of diseased plants early in the season, and the production of virus-free bulb stocks in areas free from the disease.

In 1940, the East of Scotland College of Agriculture started work on the propagation of healthy shallots by selecting relatively healthy stocks and planting them in isolation in the College Garden, Liberton. In 1945 the progeny of healthy 'true' shallots were distributed to growers for planting in virus-free areas. The selected cloves grew more quickly and were superior to foreign bulbs, which always showed traces of the virus infection, even if certified as free from disease.

A scheme of shallot inspection has been initiated by the Department of Agriculture for Scotland and it is hoped that in future growers will have their stocks examined for certification. Bulbs grown for certification should be planted at least 50 yards from onions, leeks, and allied crops.

Kuntz (J. E.) & Walker (J. C.). **Virus inhibition by extracts of Spinach.**—*Phytopathology*, xxxvii, 8, pp. 561–579, 3 graphs, 1947.

The extracts of spinach, garden and sugar beet, and chard (*Beta vulgaris* var. *cicla*) leaves, mixed in equal parts with the infectious juice of tobacco containing the tobacco mosaic virus and that of cabbage harbouring the cabbage A strain of the turnip mosaic virus [*R.A.M.*, xxiv, p. 438], caused semi-total or total inactivation of those juices. Similar results followed the addition of equal parts of spinach extract to juices containing the viruses of tobacco ring spot, latent potato ring spot [potato virus X], Larson's necrotic potato ring spot [a strain of potato virus X: ibid., xxiii, p. 240], and cucumber mosaic [cf. ibid., xii, p. 108; xiii, p. 601]. The action of the spinach extract was instantaneous and did not increase with time; its inhibitive effect was retained for at least 15 months at room temperature.

Dilution of the spinach extract with distilled water reduced its inhibitive action on the tobacco and turnip mosaic viruses. After adsorption by norite and nuchar W (activated charcoal) the extract did not appreciably impair the infectivity of the tobacco mosaic virus but was still inhibitive to that of turnip mosaic. Ten minutes' heating of the extract at 70° C. destroyed its capacity to inhibit the tobacco mosaic virus, but even after 15 minutes at 125° it could still totally inactivate that of turnip mosaic. The anti-tobacco mosaic virus component of the spinach extract did not dialyse in measurable quantities, but the dialysate was inhibitive to the turnip mosaic virus. The adjustment of the extract to reactions between pH 1 and 12 for 24 hours followed by readjustment to pH 7 did not perceptibly modify its inhibitive effect on the tobacco mosaic virus from pH 3 to 9·5, but this property was destroyed in solutions of extreme acidity or alkalinity. When the spinach extract was diluted with 95 per cent. ethyl alcohol until the mixture contained 50 per cent. alcohol, shaken, left standing for 2½ hours, and washed with 50 per cent. alcohol, the supernatant liquid failed to inhibit the tobacco mosaic virus; moreover, none of the inhibitive principle was released by the precipitate on resuspension in distilled water. When the supernatant liquid was mixed with the turnip mosaic virus it was completely inhibitive. Following the removal from the extract by treatment with norite or heating of the factor for tobacco mosaic virus inhibition, and the withdrawal of the precipitate by filtration, filtrates were still inhibitive for the turnip mosaic virus. However, after the addition of calcium chloride to such filtrates and the filtering-off of the precipitate, the second filtrate did not inactivate the turnip mosaic virus, the inhibitory principle having presumably been destroyed by precipitation with calcium chloride.

Cook (H. T.), Nugent (T. J.), Parris (G. K.), & Porter (R. P.). **Fusarium wilt of Spinach and the development of a wilt resistant variety.**—*Bull. Va Truck Exp. Sta.* 110, 10 pp., 10 figs., 1947.

Fusarium wilt of spinach (*Fusarium oxysporum* f. *spinaciae*) [*R.A.M.*, xxvi, p. 326] causes considerable damage to early plantings in Tidewater, Virginia; as many as 90 per cent. of the young plants may be killed in some fields. It is most destructive in early autumn when the soil temperature is about 72° F. Soil infestation can be retarded by harvesting spring spinach before the warm weather and by crop rotation. A wilt-resistant strain of Virginia Savoy has been developed from selections first made from commercial Virginia Savoy grown on infested soil in late August, 1936, further selections from the same line being made in each subsequent year. The soil was infested by sowing oats on which the fungus had been cultured. By 1940 70 per cent. of the resistant strain survived in heavily inoculated soil against 33 per cent. of the commercial Virginia Savoy in the control rows. The selections showed excellent resistance in commercial plantings made in 1942. By 1946 there were further type improvements and again over 70 per cent. of the selected plants survived where plants from commercial seed were killed by the end of January, 1947. Seed from the lot used for this planting has been released to seedsmen for multiplication. Field selection was found to be the best method for obtaining resistant strains.

Dillon Weston (W. A. R.) & Cronshey (J. F. H.). **Clean seed—clean Celery.**—*J. Minist. Agric.*, liv, 7, pp. 322–325, 1947.

In order to reduce celery seed infection by *Septoria apii-graveolentis* [and *S. apii*: *R.A.M.*, xxv, p. 249; xxiv, p. 305] in the 1946 crop, heavily infected plants were given two Bordeaux sprays from November to December, 1945, and fortnightly applications from April, 1946, up to 14 days before the seed was harvested. The treatments reduced seed infection to 0·5 per cent. and the yield was 36 lb. seed, sufficient to provide plants for over 300 acres. The total cost of spraying was about £5 and therefore the cost of reducing seed infection from 84 to ½ per cent. was equivalent to about 4*d.* per acre. Furthermore, the seed had the unusually high germination capacity of 90 per cent. Had the spraying programme commenced earlier seed infection would have been negligible. Excellent results have been obtained by growers using clean seed and there is no doubt that it can be produced on a commercial scale. In producing clean seed it is essential that the seed crop should be sprayed regularly and thoroughly throughout its life, although in favourable seasons spraying need not begin until the second year. A reliable spray such as home-made Bordeaux mixture, applied carefully with a knapsack sprayer, should be used.

Clean seed will lessen the risk of contamination during the raising of seedlings by specialist growers, and if some stocks are diseased, each should be confined to one set of boxes, frames, and beds, and the distance between the latter increased. Non-clean seed should be treated with formalin and the young plants sprayed with Bordeaux before the subsequent field applications.

Dolan (D.). **A new anthracnose on Melons.**—*Phytopathology*, xxxvii, 8, pp. 583–596, 4 figs., 1947.

A new anthracnose is described from western New York on muskmelons and watermelons; since 1943 the disease has increased in prevalence and in 1944 and 1945 it caused heavy damage to the crops. The most salient symptom is the development, mainly on the leaf petioles and veins, of small, pink to light brown spots, which gradually coalesce to form dark brown, linear lesions. The diseased petioles become very brittle and break or turn brown and shrivel, so that only the

vein remains: frequently the terminal parts of the latter also develop streaks up to 7 or 8 in. long and die.

The fungus isolated on potato dextrose agar from the diseased tissues was identified as a new species of *Marssonina*, to which the name of *M. melonis* is assigned. Its most prominent features are its pink coloration in culture and copious production of uniseptate, subrectangular conidia, 8 to 10 by 1·7 to 3·3 μ, with a hyaline protoplasm, one to many of which are borne in heads on the ends of short conidiophores and cling together in groups. Three out of ten monospore subcultures produced a white growth in contrast to the pink of the original isolates and gave rise to slightly smaller conidia, 5 to 7 by 1·5 to 3 μ.

An aqueous suspension of *M. melonis* proved to be non-pathogenic to Bender Surprise muskmelon seedlings in a poorly lighted greenhouse during the winter months. Under such conditions, ungerminated conidia are found in profusion on the leaves 48 hours after inoculation. Heavy infection ensues, however, on the addition of 1 gm. dextrose to each 200 ml. spore suspension before inoculation. In spore germination tests no germination took place at a dextrose concentration of less than 0·1 mg. per ml. and 5 mg. was necessary for abundant sporulation. The conidia do not germinate in a mineral salt solution, indicating the necessity of an energy source: the maximum percentage was obtained in a medium containing both mineral nutrients and dextrose. Germination took place in guttated fluid from melon plants growing under strong illumination but not in the dark. Germination from both ends of the conidia is common, and in nutrient medium a germ-tube may be produced at one extremity and a fertile conidiophore at the other. The conidia of both the pink and white isolates of *M. melonis* germinate at a lower relative humidity (88 per cent.) than those of *Colletotrichum lagenarium* (95). At low temperatures *M. melonis* grows much more rapidly than *C. lagenarium*; for instance, after 12 days at 48·2° F. the colony diameter of the former (pink and white) measured 9 and that of the latter 2 mm., the corresponding figures at 59° being 25, 27, and 15 mm., at 67·1°, 40, 47, and 36, and at 75·2°, 73, 76, and 66, respectively. After 49 days at 48·2 the pink and white isolates of *M. melonis* measured 51 and 68 mm., respectively, and *C. lagenarium* 10 mm.

In varietal reaction tests the Conomon muskmelon and its relatives the white melon and Freeman cucumber exhibited definite resistance to *M. melonis*, with average infection ratings in an ascending scale ranging from 0 to 9 of 0·4 and 2·9 (two plantings), 2·5, and 2·6, respectively, compared with 7 and 8·2 for two plantings of Bender Surprise, and this response was dominant in the F_1 progenies. A fair degree of resistance was also manifested by Asgrow's Honeydew, Accession 106, and Mardela (4 and 4·4, 4·1, and 4·5 and 4·1, respectively). Moreover, several muskmelons from the Division of Plant Exploration and Introduction of the United States Department of Agriculture proved more resistant than Bender Surprise and other commercial varieties tested. Of the four watermelons included in the trials, Honey Cream was the most resistant (2·9 and 3·6 in two plantings). In parallel tests with *C. lagenarium* the maximum resistance was displayed by the Conomon and Cassaba muskmelons and McCrea resistant watermelon.

Garren (K. H.) & Higgins (B. B.). **Fungi associated with Runner Peanut seeds and their relation to concealed damage.**—*Phytopathology*, xxxvii, 7, pp. 512–522, 1 fig., 1947.

Investigations are in progress at the Georgia Agricultural Experiment Station on concealed damage to runner groundnut seeds [*R.A.M.*, xxiv, p. 489], a matter of considerable concern to processors at the present time. The condition develops when one of the common soil-borne saprophytes associated with groundnut fruits, e.g., *Diplodia* sp. or *Sclerotium bataticola* [*Macrophomina phaseoli*], invades the intercotyledonary space through the placenta. Visible damage, on the other hand,

mostly results from the activity of fungi (largely identical with those responsible for concealed injury) in the space between the shell and the seeds.

The inoculation of groundnut fruits with a specific fungus leads to antagonisms and competitions, in which *D.* sp. and *M. phaseoli* usually outdistance all concurrents. The existence of similar relationships in soils and curing stacks would explain the predominance of these two organisms in field isolations from seeds with concealed damage. Evidence was also forthcoming of the implication of other fungi, e.g., *Rhizopus*, *Mucor*, and *Fusarium* spp., in the etiology of the disorder, but the presence of various organisms in the sound fruits complicated laboratory tests. The exposure of harvested groundnuts to conditions favouring the development of the rapidly growing *R.* sp., *D.* sp., and *Macrophomina phaseoli* may promote concealed damage from the early saprophytic activity of these fungi.

Since the agents of concealed damage were shown experimentally to be already present in groundnut fruits taken directly from the soil, control measures must necessarily be limited to the prevention of further growth during the curing process. Work proceeding in Georgia and Alabama (*Plant Dis. Reptr*, xxix, pp. 61–63, 1945) indicates that concealed damage may be significantly reduced by appropriate curing methods.

Asthana (R. P.). **Mushroom cultivation in the Central Provinces.**—*Mag. agric. Coll. Nagpur*, xxii, 1, pp. 26–31, 4 figs., 1947.

In this paper, which includes a résumé of the work done by other authors on the subject of mushroom cultivation, the author states that, in the cultivation of the paddy-straw mushroom *Volvaria diplasia* [*R.A.M.*, xxii, p. 512; xxvi, p. 531], when powdered 'dal' is not added to the medium, sporulation is scanty and such a spawn hardly gives any crop. Better yield is obtained through the addition of powdered gram [*Cicer arietinum*] 'dal' rather than tur (*Cajanus indicus*) [*C. cajan*] 'dal', the best period for cultivation in the Central Provinces being from April to June. Chemical analysis of the mushrooms showed that nearly 33 per cent. of the dry matter is protein, 50 per cent. carbohydrate, and the rest fibre and minerals.

Pizer (N. H.) & Leaver (W. E.). **Experiments with soils used for casing beds of the cultivated Mushroom, Psalliota campestris.**—*Ann. appl. Biol.*, xxxiv, 1, pp. 34–44, 1947.

An account is given of observations and experiments on the influence of the casing soil on the cropping of beds of cultivated mushrooms (*Psalliota campestris*) [*R.A.M.*, xxvi, pp. 141, 375]. It is a remarkable fact that beds must be covered with a layer or casing of 'soil' to bring them into bearing and without this few or no mushrooms are produced. This casing should remain in a porous, granular condition when watered repeatedly and settle with the compost as the latter shrinks during cropping. In 1938, when the authors visited 39 mushroom farms where cultural conditions were good and the beds were well run with mycelium, they found that yields varied from ½ lb. to more than 3 lb. mushrooms per sq. ft. of bed. At one farm beds were found to be cropping slowly and producing small, light mushrooms except on a small section of one bed where the mushrooms were heavy and crowded together. The casing soil of this good section had been taken from a different part of the field from the main bulk of the soil. This survey shows that when the cultural and compost conditions are suitable for cropping, mushroom production may depend largely on the soil used for casing.

Casing soils are classified into four grades according to the numbers of sporophores formed, their rate of growth, and the type of mushroom produced. In order to assess the cropping potentialities of soils freshly prepared, fully run pure-culture mushroom spawn was thoroughly crumbled and mixed together. Spawn of a white mushroom variety was used as it is believed to be less vigorous and more commonly

grown than that of the brown varieties. For each experiment a layer 2½ in. deep was pressed into the bottom of a 3 by 5¾ in. deep Pyrex beaker. The air-dried casing soil was ground finely, passed through a 3 mm. round-holed sieve, brought to a granular condition with distilled water, and placed on top of the spawn to a depth of 1 in. The beakers were covered with 3½ in. diameter watch-glasses supported on rubber cushions and stored at 70° F. for a few days until the mycelium began to enter the soil, after which they were kept at 55° to 60°. The beakers were watered when necessary until the mycelium had grown well into the soil, when it was absorbed very slowly. After their first appearance in 10 days sporophores continued to form for many weeks. With a soil that crops well the experiment is usually terminated by disturbance and loss of soil in removing mushrooms. Examples are given of the use of this method for investigating field factors affecting the selection of casing soils and the nature of the soil factors affecting cropping. It is suggested that there may be chemical substances or those with specific surface action in soils which may promote cropping but close contact with air is necessary for them to be effective. It is concluded that the value of casing materials must be assessed by direct trial and that considerable fundamental research on casing soils is needed.

Nedeltscheff (N.), Kondareff (M.), & Stoeff (K.). Наблюдения върху третирането на лозитѣ противъ пероноспората. [Observations on treatments against mildew.]—*Annu. Univ. Sofia*, xxi, 1, pp. 91–100, 1943. [French summary. Received September, 1947.]

This work is a further contribution to the study of low-strength Bordeaux mixture, which at 1 per cent. copper sulphate had been shown to be sufficient to control vine [downy] mildew [*Plasmopara viticola*: *R.A.M.*, xxi, p. 402 and cf. p. 285] at Saranevo, Bulgaria. As the requisite amount of copper sulphate was not always available experiments were made in 1941 with Bordeaux at 1·5, 1, 0·75, 0·5, 0·35, and 0·2 per cent. (with a slightly alkaline reaction) in order to determine how far the strength could be reduced without endangering the yield. The efficacy of a mixture containing 0·2 per cent. copper sulphate and 5 per cent. slaked lime and of a 0·33 per cent. cuprenox [ibid., xix, p. 6] containing 28·8 per cent. copper were also tested.

The year 1941 was favourable to the development of mildew. In the experiment four rows of Bolgar vines were treated with each product, the results of the two middle rows only being taken. Treatments were given on 15th, 21st, and 28th May, 4th, 12th, and 21st June, and 6th July. On 25th June counts were taken of diseased leaves, and by 19th July there were signs of infection on the bunches of grapes. The results indicated that the concentration of Bordeaux mixture can be reduced to 0·5 per cent. copper sulphate (58 leaves and 0·9 per cent. grapes mildewed) without reducing the yield, that cuprenox (179 and 10·4) is satisfactory for controlling *P. viticola*, and that 4 per cent. zinc sulphate is ineffective (507 and 100 per cent., respectively).

Gallay (R.). **La dégénérescence infectieuse de la Vigne.** [The contagious degeneration of the Vine.]—*Rev. romande Agric., Vitic., Arboric.*, iii, 8, pp. 59–61, 6 figs., 1947.

A group of experts sent by the Office international du Vin to investigate vine court-noué [*R.A.M.*, xxvi, p. 528] have suggested that the disorder should be called infectious degeneration. The chief symptoms are the dwarfing of the main stem and the setting of the nodes at alternately long and short distances along the stem with the frequent occurrence of double nodes. Sometimes the tendrils grow into branches, and the vine frequently appears bushy like a pollarded willow owing to the over-development of the terminal buds. The flattened stems often divide on

a level with the nodes or along the internodes to form two or more branches. The leaves may be dwarfed, excessively dentate, asymmetric, dull, and variegated, in which case the chlorosis spreads from the veins towards the edges of the leaves as distinct from that due to calcium deficiency.

Plant Pathology.—*Rep. E. Afr. agric. Res. Inst., Amani, 1942–1945*, pp. 7–10, 1946.

The work dealt with in this report [cf. *R.A.M.*, xxi, p. 241] on cassava breeding in East Africa against mosaic and brown streak and on the virus disease of sweet potato found locally and in adjoining areas has already been noticed from other sources [ibid., xxvi, pp. 145, 281].

Nichols (R. F. W.). **Plant pathology—report for 1946.**—*Rep. E. Afr. agric. Res. Inst., Amani, 1946*, pp. 13–15, 1947.

In this report [see preceding abstract] the author states that during a survey of the cassava-growing areas of Northern Rhodesia and Nyasaland, cassava brown streak disease [*R.A.M.*, xxvi, p. 281] was not found at altitudes over 3,500 ft., though primary infections of mosaic occur at about 6,000 ft. Observations have shown repeatedly that the effects of brown streak are worse under relatively low temperature conditions, and it may be that at elevations over 3,500 ft. primarily diseased plants are killed outright. This point requires experimental investigation.

The first series of trials at Mlingano, completed in July, 1946, showed that the infection rate of both mosaic and brown streak was very high in susceptible clones, a fact which enables greater reliance to be placed on the behaviour of the more resistant clones. Of 180 clones tested, seven resisted infection by mosaic and 47 remained free from brown streak; included in these were two Ceara [*Manihot glaziovii*] hybrids and three *M. dichotoma* clones which remained unaffected by either disease [loc. cit.].

No success has so far been achieved in the search for an insect vector of the virus disease of sweet potato [ibid., xxvi, p. 145]. This disease is probably more widespread than was thought; it has been found in many parts of Tanganyika, and plants in the Nelspruit area of the Eastern Transvaal have been found showing apparently identical symptoms.

Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1945.—63 pp., 1946.

The following items are of interest in this report [cf. *R.A.M.*, xxiv, p. 491]. Annual inspection covering 294 nurseries in 16 southern United States revealed that phony peach and peach mosaic [virus] diseases [ibid., xxvi, p. 190] were less prevalent during 1944, 72,053 diseased trees being removed. Only two nurseries in the south-eastern phony peach area and one nursery and two dealers in the south-western peach mosaic area were found ineligible for certification. Illinois has been released from quarantine restrictions. Most of the phony peach infection continues to occur in Alabama and Georgia.

Dutch elm disease (*Ceratostomella ulmi*) [ibid., xxvi, pp. 45, 47] control procedures were concentrated on determining where the disease occurs, advising elm owners of control measures, and testing methods of disease control in selected areas. Scouting efforts, concentrated on 20-mile zones surrounding the main disease region, and isolated areas centring at Frederick and Cumberland, Maryland, Athens, Ohio, and Indianopolis, Indiana, added 8,339 square miles to the known disease area, which now includes Virginia and West Virginia. More significant linear extensions were 22 miles north-east in Connecticut, 18 miles north in Massachusetts, 30 miles north in the area of Binghamton, New York, and in

Pennsylvania a 35-mile extension south-west reaching 18 miles into the northern tip of Delaware. The disease centre around Athens showed an eruptive type of spread, with extensions of 20 to 25 miles in all directions except north, where spread was limited to 12 miles.

Continued progress was made in developing methods of culturing the fungus from the galleries of the elm bark beetle [*Scolytus multistriatus*: ibid., xxv, p. 570]. This technique often discloses the presence of the fungus before symptomatic trees are observed. About 60 per cent. of the specimens taken were found to be infected. Improved results were obtained by the use of low temperatures in the incubation rooms. During the year 10,930 specimens of elm wood and bark collected by Bureau scouts were cultured, and 888 were found infected.

All diseased trees and beetle-infested material found by Bureau scouts in Massachusetts, Delaware, Maryland, Virginia, and Indiana were removed and destroyed by State agents. In Connecticut all diseased elms east of the Connecticut River were removed. Pennsylvania, Ohio, and West Virginia took no effective steps to remove diseased material.

Thirty small centres around individual diseased trees were surveyed to study the spread of the Dutch elm disease under controlled conditions. Four of these centres showed no increase in disease, but 24 showed an average increase of 600 per cent. During the year 80 new cases developed on one plot and 130 on another.

Barberry eradication resulted in the reduction of cereal losses from stem [black] rust (*Puccinia graminis*) from an average of 48,000,000 bush. annually for the period 1915 to 1928 to 24,000,000 for 1929 to 1942. As a result of the scheme, 738,213 square miles are now practically free of barberry bushes; 129,059 square miles of initial work remain and 210,929 must be re-worked in the future. Re-working of barberry sites at about five-year intervals is necessary until there is no further recurrence of bushes.

The most prevalent races of wheat black rust [ibid., xxv, pp. 62, 300] during 1944 were 56, 38, 17, and 19, constituting 44, 27, 21, and 7 per cent., respectively, of all the isolates. Races 2 and 5 of the oat black rust [ibid., xxiv, pp. 356, 498] made up 67 per cent. of the isolates, while 8 and 10 made up the rest.

The method for the control of white pine blister rust [*Cronartium ribicola*: ibid., xxiv, p. 40] was improved. Tests with ammonium sulphamate showed that this chemical is more effective for the eradication of *Ribes lacustre* than any herbicides previously tested. Tests on greenhouse-grown *R. roezlii* with 2,4–D in a polyethylene glycol carrier showed that it was toxic in concentrations as low as 0·08 per cent.

Fifty-ninth Annual Report of the Kentucky Agricultural Experiment Station for the year 1946.—68 pp., 1947.

In this report [cf. *R.A.M.*, xxvi, p. 46] it is stated that eight varieties of spring-sown oats in Kentucky gave low average yields owing to severe infection by *Helminthosporium victoriae* [ibid., xxvi, p. 99; xxviii, p. 16]. Columbia, Fulton, Clinton, and Benton and a selection of Victoria-Richland × Morota-Bond were only lightly infected. Several new strains having the Bond type of resistance to crown rust [*Puccinia coronata*] also showed promise of resistance to this new disease.

Varieties of dark and Burley mosaic-free tobacco have been developed by crossing tobacco with *Nicotiana glutinosa*. Further crosses using Burley with *N. gossei* for resistance to tobacco streak virus, and with *N. glauca*, were made, colchicin treatment being used to induce fertility in the hybrids and back-crosses. A cross between the *N. glauca-tabacum* and *N. tabacum-longiflora* [ibid., xxvi, p. 358] hybrids has proved highly resistant to wildfire [*Pseudomonas tabacum*: loc. cit.].

In order to assist the testing of tobacco varieties and *Nicotiana* spp. for streak-resistant breeding stock a simple and reliable method of making inoculations is

described, young leaves of systemically infected plants providing a reliable standard source of the virus. The use of M/10 disodium hydrogen phosphate with carborundum materially increases the percentage of positive inoculations. The results of inoculating 35 *N.* spp. with the tobacco streak virus showed that most of them were moderately susceptible; *N. benthamiana*, *N. clevelandii*, *N. megalosiphon*, and *N. miersii* developed a systemic infection resulting in severe necrosis and often death of the plant, whereas *N. glauca* and *N. gossei* seemed sufficiently resistant to be valuable as breeding material.

In further studies on the host range of *Cercospora* [? *nicotianae*: ibid., xxvi, p. 515], typical frog eye spots were induced on *N. rustica* by inoculation with *C.* spp. from a variety of wild and cultivated plants.

Once again Ky 16 and Ky 41A, resistant to black root rot [*Thielaviopsis basicola*], showed delay in maturing but gave good yields compared with Ky 22 and other recently developed and more resistant varieties when grown in rot-infested soil. The disease was favoured by the cool, wet setting season. Of the new Burley tobacco varieties, Ky 56, almost identical in appearance with Ky 16, is highly resistant to black root rot, is mosaic-resistant, and is recommended for extensive trial. The black-rot resistant Ky 24 gives moderate yields of high quality, has the plant characters of Warner, and, like the latter, produces many suckers. The rot-resistant Ky 25 has the plant characters of Golden Burley.

During 1946 the new mosaic-resistant One-Sucker tobacco Ky 160 was grown with marked success in several counties. Certified seed should be available to growers for the 1947 crop. In one county the dark, fire-cured tobacco Ky 151 was successfully grown with regard to mosaic resistance, quality, and yield. Mosaic of the burning type caused considerable damage to primed Burley tobacco in 1946.

The co-operative orchard spray service continued to grow in popularity among commercial fruit-growers, information on insect, disease, and fruit development being broadcast weekly from the regional spray service office (a united project of Kentucky, Illinois, and Indiana) in addition to spray letters.

Although early maturity of spores (end of February to early March) and the cool, wet weather of April and May favoured the development of apple scab [*Venturia inaequalis*: ibid., xxvi, pp. 32, 342], control was unusually successful and general.

In 1946 strawberry red stele disease [red core (*Phytophthora fragariae*): ibid., xxvii, p. 28] caused much damage to the planting on the Experiment Station farm and seemed to be spreading in commercial areas. On areas of soil with a high nitrogen content, reduction in nitrogen by the use of a straw mulch caused no decline in strawberry yield, although *P. fragariae* was more severe in areas where soil nitrogen was low than where it was higher.

Botany.—*Rep. Ga Exp. Sta., 1945–6*, pp. 68–77, [? 1946].

This report [cf. *R.A.M.*, xxv, p. 332] contains, *inter alia*, the following items of phytopathological interest. Soil inoculation experiments to determine the effect of seed treatment of snap beans [*Phaseolus vulgaris*] with 2 per cent. ceresan on the incidence of *Macrophomina phaseoli*, *Sclerotium rolfsii*, and *Rhizoctonia* [*Corticium*] *solani* in 1945 showed that *M. phaseoli* was controlled almost completely, there being no post-emergence infection. Infections by the two other pathogens continued to occur during the seedling stage. In 1946 considerable increase in stand resulted from seed treatment in soil inoculated with *S. rolfsii* and *C. solani*, although the stand was still poor.

The results of experiments on groundnut seed treatment [ibid., xxvi, p. 332] tended to confirm the 1944 results, namely, that all varieties grown in Georgia may be shelled at any time during winter provided that they are treated at the time of shelling or at any time most convenient before planting. The six treatments used

on the varieties North Carolina Runner, Virginia Bunch, and North Carolina Bunch, in descending order of effectiveness, were 2 per cent. ceresan, arasan, spergon, U.S. Rubber Co. No. 604, dow 9B and du Pont 1452F (all at 3 oz. per 100 lb. seed except arasan, 2 oz.). The ceresan treatment was significantly superior to the dow 9B and du Pont 1452F with some seed lots, and proved the most reliable for treating damaged or low-viability seed. The results of dusting and spraying tests against groundnut leaf spot [*Cercospora arachidicola* and *C. personata*: ibid., xxvi, p. 181] at five locations in four counties indicated that dilution of sulphur dust with magnesium oxide (80–20) reduced its efficiency, giving a yield increase of only 185 lb. against 235 lb. for undiluted sulphur dust. The efficiency of Bordeaux was apparently increased by substituting magnesium oxide for lime in the spray, the respective increases in yield being 422 and 289 lb.

'Southern blight' (*S. rolfsii*) [ibid., xxv, p. 199] causes considerable damage to groundnuts in some areas every year, being most serious when it attacks and rots the pegs, causing loss in harvesting.

The past year's breeding work on cantaloupes has been mainly concerned with growing, testing, and selecting in the various strains resulting from the S2–IS Smith Perfect and S20 Smith Perfect crosses. A number of seedlings appear to be resistant to both downy and powdery mildews [*Pseudoperonospora cubensis* and *Erysiphe cichoracearum*: ibid., xxvi, pp. 180, 477]. Some field plants also showed resistance to blight caused by *Macrosporium* [*Alternaria ? cucumerina*: ibid., xix, p. 578] which had overwintered in the soil.

Strains of common vetch were particularly subject to anthracnose (*Colletotrichum villosum*) [ibid., xxv, p. 216]. Hungarian (*Vicia pannonica*) and *V. grandiflora* appear to be highly resistant, although the latter is highly susceptible to leaf [chocolate] spot caused by *Botrytis* [*? cinerea*]. At present, rotation seems to offer the best method of control. *V. tetrasperma* and *V. lathyroides* have been added to the list of species [loc. cit.] known to be susceptible.

A root, stem, and crown rot of blue lupins [*Lupinus hirsutus*] caused by *B. cinerea* was more prevalent than ever before. Yellow lupins (*L. luteus*) were not affected.

A mild infection of charcoal rot of soy-beans (*Macrophomina phaseoli*) [ibid., xxv, pp. 56, 61] was noticed on the roots and stem bases of mature plants. Experiments have shown that soy-beans, under some conditions, are probably susceptible to infection by *M. phaseoli* in the pre-emergence state. Another experiment showed that *S. rolfsii* never spread more than about 1 ft. along a soy-bean row and only one or very few plants at one place are attacked.

On p. 17 it is stated that in co-operation with the Seedling Disease Committee new dust disinfectants and methods of re-ginning, delinting, and matting cotton seed were compared [ibid., xxvi, p. 450]. Du Bay [du Pont] 1452F was the most effective dust, giving 71·3 per cent. seedling emergence, an average increase of 35·8 per cent. over untreated seed. Advanced lines of the hybrid CSS 3720 appeared extremely promising for resistance to wilt [*Fusarium vasinfectum*: ibid., xxvi, p. 543]. Several selections of this hybrid are being increased for commercial trials and a number of Sea island Upland hybrids are being continued for the development of better qualities.

CONN (H. J.). **A protest against the misuse of the generic name Corynebacterium.**—Abs. in *J. Bact.*, liv, 1, p. 10, 1947.

The author deplores the recent tendency to include a great variety of organisms in *Corynebacterium* [*R.A.M.*, xxi, p. 364; xxii, p. 208], which changes the primarily non-motile genus into a miscellaneous group including monoflagellate plant pathogens and the so-called 'corynebacteria' of soil origin. The latter differ greatly physiologically, morphologically, and in their staining reaction, and should be placed in a separate, though possibly closely related, genus.

Jones (S. G.). **An anatomical study of crown-gall tumors on the Himalaya Giant Blackberry (Rubus procerus).**—*Phytopathology*, xxxvii, 9, pp. 613–624, 8 figs., 1947.

The subaerial galls induced by *Bacterium tumefaciens* in spontaneous infection on Himalaya giant blackberry (*Rubus procerus*) stems at the University of Glasgow, Scotland, were found to originate in the outer layers of the pericycle, consisting of rectangular cells with thin cellulose walls. Increments of lignified tracheids to the terminations of the medullary rays in proximity to the intumescence are responsible for the disruption of the phloem tissues, accompanied by an extensive deposit of crystals, probably of calcium oxalate. A conspicuous sequel to this accumulation of lignified tracheids is the appearance of one or two deep indentations in the contour of the normal cambium of the woody cylinder opposite to the medullary rays involved. The distribution of the tracheids within the tumour appears to be a function of the activity of numerous meristematic zones or cambial arcs in the gall parenchyma [cf. *R.A.M.*, vii, p. 144; ix, p. 735, *et passim*].

Kugler (W. F.), Horovitz (N.), Foucault (S.), Cialzeta (C.), Lemos (O.), Etchecopar (J. A.), & Illia (M.). **Descripción de las principales variedades de Trigo, Avena, Cebada, Centeno, Lino y Maiz, cultivadas en la República Argentina.** [Description of the leading Wheat, Oats, Barley, Rye, Flax, and Maize varieties cultivated in the Argentine Republic.]—*Publ. Minist. Agric., B. Aires*, 20, 262 pp., 157 figs., 1945. [English summaries. Received November, 1947.]

Among the characters investigated in these exhaustive studies on the leading cereal and flax varieties cultivated in Argentina were the reactions of wheat to *Puccinia* spp. [*R.A.M.*, xxi, p. 518 *et passim*]; barley to *Helminthosporium gramineum*, *H. sativum*, *H.* [*Pyrenophora*] *teres* [loc. cit.], *Erysiphe graminis*, and *Rhynchosporium secalis* [ibid., xxi, p. 246]; oats to *P. coronata* [ibid., xxi, p. 518] and *P. graminis*; and flax to wilt (*Fusarium* sp.), rust (*Melampsora lini*) [ibid., xxv, p. 213; xxvi, p. 214], and 'pasmo' (*Septoria linicola*) [*Sphaerella linorum*: ibid., xxi, p. 246].

Forlani (R.). **Sterilità in alcune Graminacee e infezioni da Claviceps sp.** [Sterility in some Graminaceae and infections by *Claviceps* sp.]—*Genet. agrar.*, i, 2–3, pp. 218–224, 3 figs., 1947. [Latin and English summaries.]

From his studies at an experiment station of the National Institute of Genetics, Rome, the author concludes that the greater susceptibility of rye to infection by *Claviceps purpurea* [*R.A.M.*, xxvi, p. 391] in comparison with wheat is due to the fact that the former is open-pollinated, whereas the latter is nearly always self-fertilized. It was observed, however, that certain sterile interspecific and intergeneric hybrids of wheat, e.g., *Triticum sativum* × *T. monococcum*, *T. spelta* × *T. monococcum*, *T. durum* × *T. monococcum*, *T. dicoccum* × *T. monococcum*, *T. turgidum* (del miracolo) × *Aegilops ovata*, *T. dicoccum* × *Aegilops ovata*, and *T. macha* × *T. secale*, remained immune from the ergot fungus notwithstanding the wide opening of their glumes during flowering. It would appear, therefore, that germination on the developing seed is an essential preliminary to the further growth of *C. purpurea* spores.

During 1946 ergot sclerotia were detected on the ears of the following semi-sterile hybrids: F_4 of Mentana × *A. ovata*, F_2 of (Mentana × *A. ovata*) × *T. macha*, (*T. lutescens* 062 × *Agropyron glaucum*) × Roma, Damiano × (*T. lutescens* 062 × *A. glaucum*), Quaderna × (*T. lutescens* 062 × *A. glaucum*), Quaderna × (*T. orientale* × *A. glaucum*), Fanfulla × (*T. orientale* × *A. glaucum*), (*T. orientale* × *A. glaucum*) × Damiano, 210 × (*T. lutescens* 062 × *A. glaucum*), Damiano × *T. timococcum*, and the

F_1 of (*T. lutescens* 062 × *A. glaucum*) × rye. They were also found on *T. monococcum*, *Lolium perenne*, *L. italicum*, *L. temulentum*, and *A.* sp.

The sclerotia varied greatly in numbers, e.g., one, two, seven, or eight, and in shape. On rye, for instance, they were long corniform, on wheat large and stout (up to 17 or 18 by 6 to 7 mm.), slender and elongated on *L.* spp., bacilliform on *A.* sp., and larger than a caryopsis and oval on wheat. In general, the sclerotia are about the same size as the caryopsides of the species parasitized or often rather smaller, in which case they tend to escape observation.

Grainger (J.). **The ecology of Erysiphe graminis DC.**—*Trans. Brit. mycol. Soc.*, xxxi, 1–2, pp. 54–65, 1 pl., 1 fig., 10 graphs, 1947.

This is a full account of work already noted from another source [*R.A.M.*, xxvi, p. 296].

Garofalo (F.). **Recettività di fronte all' Erysiphe graminis da parte di piante di Frumento amputate negli organi fiorali.** [Susceptibility to *Erysiphe graminis* of Wheat plants amputated in the floral organs.]—*Boll. Soc. ital. Biol. sper.*, xxiii, 5, pp. 511–513, 1947.

Experiments were performed at the Institute of Plant Pathology, Palermo, to determine the effect of excision of the floral organs on the reaction of Mentana wheat to mildew (*Erysiphe graminis*). Four pots were selected, each containing 50 culms; in three the ears, not yet in full bloom, were amputated at the base, while in the fourth they were left intact. The plants were exposed to the light [cf. *R.A.M.*, xxvi, p. 538] at room temperature and after 24 hours all four were inoculated with a conidial suspension of *E. graminis* from naturally infected plants. Symptoms of the disease appeared on the amputated plants on the fourth day, and by the tenth all the leaves were heavily infected, whereas the intact controls showed few or no signs of mildew. Comparable tests were carried out on plants in anthesis, from which all the incipient sporophylls on every ear were excised in three pots, while a fourth was left undisturbed. Infection of the mutilated plants supervened on the third day and increased in severity up to the sixth; the controls again remained quasi-immune.

Ciccarone (A.). **Appunti sulla coltivazione del Frumento nel Kenya con particolare riguardo al problema delle ruggini.** [Notes on the cultivation of Wheat in Kenya with particular regard to the problem of rusts.]—Reprinted from *Riv. Agric. subtrop. trop.*, xli, 1–3, 23 pp., 1947.

This is a succinct, well-documented, and interesting review of the history of wheat-growing in Kenya from the beginning in 1904 until to-day, with particular reference to the problem of rusts and what has been done locally to solve it [*R.A.M.*, xxvi, p. 539 *et passim*]. The first varieties planted were the Australian wheats Bobs and Gluyas and the Italian Rieti. In 1905 and 1906, *Puccinia graminis* appeared, while at the higher elevations *P. glumarum* was also found. A year later, both diseases assumed epidemic proportions, and the cultivation of the Australian varieties had to be abandoned. In 1912, *P. rubigo-vera tritici* [*P. triticina*] occurred. Hybridization studies led to the development of Kenya Governor and Equator wheats, the former resistant to *P. graminis* and the latter to *P. glumarum*. Work was next directed to a study of the physiologic races of the rusts, and by 1934 hybrid wheats had been obtained which were resistant to the four races of *P. graminis* found locally. A fifth race was later discovered, and in 1940 a sixth. At present, control is based on the constant search for resistant varieties, the prohibition of the importation of new wheats, the determination of the best sowing time in each locality, the destruction of semi-wild wheat plants, and the use of rotations.

Growers are also advised to test all varieties for resistance before planting them on a large scale.

Soutter (R. E.). **Progress in Wheat breeding, 1946–47.**—*Qd agric. J.*, lxv, 2, pp. 101–114, 7 figs., 1947.

During the 1946 season in Queensland a comparison was made between 14 introduced wheat varieties and 14 native productions, comprising three older varieties and 11 new crossbreds. The reactions of the introduced wheat varieties most resistant to or immune from stem [black] rust [*Puccinia graminis*: *R.A.M.*, xxvii, p. 12] and leaf [brown] rust [*P. triticina*: ibid., xxvi, p. 98], 0 indicating complete absence and 6 maximum rust infection, were: Charter 0 black rust, 2 leaf rust, Gabo 0 and 1, Celebration 0 and 2, Yalta trace and 3, Hofed 2 and 1, Kendee 1 and 2; and for the local varieties and hybrid selections K54P4–4608 and –4625 (Kenya 10854 × Pusa 4) 0 and 4; KGPF–4613, –4521, –4672, and –4655 (Kenya Governor × Pusa × Flora–3202), and P. Harv.–4607, 0 and 3; SF. PFHS.–4607 (Seafoam twice, Pusa 4, Flora, Hope) and Wheat Rye 4601 (Kenya Governor × an unknown rye) 2 and 1, and KGPF–4676 and –4508 0 and 2. All the varieties immune from or slightly resistant to black rust gave the highest yields and highest bushel weights. Celebration, Gabo, Kendee, and Yalta, although resistant, produced pinched kernels.

In Queensland brown rust is less serious than black because it has little effect on yields and grain appearance. Some of the new varieties showed a fair degree of brown rust resistance (1 to 4).

Apostolides (C. A.). **Comparative study of the resistance of Wheat varieties to Tilletia levis Kühn in Greece.**—*Act. Inst. bot. Univ. Athènes*, i, pp. 197–199, 1940. [Received December, 1947.]

A comparative investigation of 34 wheat varieties in 1934–35 in three localities of Greece for their reactions to inoculation with bunt (*Tilletia levis*) [*T. foetida*] revealed marked resistance in two varieties of the *Triticum vulgare* group, Katranitsa and Florence, with average infection percentages of 3·6 and 3·2 per cent., respectively, and in two belonging to *T. durum*, Arapico (0·16) and Deves (4·3). Some degree of resistance, presumed to be of genetic origin, was manifested by all the varieties under observation, and it is hoped to develop this character in further breeding experiments.

Harris (H. C.). **A nutritional disease of Oats apparently due to the lack of copper.**—*Science*, cvi, 2756, p. 398, 1947.

A disease of oats similar to that caused by a deficiency of copper in Europe [*R.A.M.*, xxvi, p. 316] and Australia [ibid., xxiii, p. 220] has been affecting certain varieties, especially Florida 167, for some years on the Experiment Station Farm, Gainesville, Florida. The affected plants grew normally until about two months after planting (in November), when they appeared smaller than healthy plants and in severe cases the characteristic marginal chlorosis began to develop on the leaves early in February. Later the margins and tips of the leaves became brown and scorched, and about the middle of February the emerging tips of the tillers were tightly rolled, turning brown and finally dying. At this stage the plants either died or continued to produce similar tillers with very few heads and very little foliage. On moderately affected plants the new tillers were late in developing, so that the plant was immature at harvest time; the whitish-green heads contain very little grain. The symptoms of a slight attack, in which the plants developed considerable blasting and light grain with some chlorosis and scorching of the upper leaves, were observed on Florida 167 on several farms in Central Florida. In field experiments in a badly affected area, using this variety, copper was applied

as copper chloride at 10 lb. per acre. Oats not receiving this treatment developed severe symptoms, producing scanty foliage, very few heads, and hardly any grain. Oats treated with copper were entirely or practically free from the disease and gave relatively good yields.

Bacterial wilt of Corn.—*Food & Agric., 1947,* 2, pp. 142–143, 1947.

The following comments were made by Dr. Jenkins, of the United States Department of Agriculture, who participated in the Food and Agriculture Organization International Hybrid Corn School at Bergamo, regarding his field observations of bacterial wilt of maize [*Xanthomonas stewarti*] in Italy, where the disease was first reported in 1935 [*R.A.M.*, xv, p. 573]. The damage to the crop is more extensive in Italy than in the United States, the entire plant generally being attacked in the former country and only the leaves in the latter. The exact mode of transmission of the disease in Italy has not been established, but the flea-beetle [*Chaetocnema pulicaria*], largely responsible for the spread of the pathogen in the United States [ibid., xvii, p. 740], does not appear to be implicated.

Goidànich (G.) & Ruggieri (G.). **Una rapida riproduzione sperimentale del 'mal secco' degli Agrumi.** [A rapid experimental reproduction of the 'mal secco' disease of Citrus.]—*Ann. Sper. agr.*, N.S., i, 1, pp. 141–145, 1947.

The first symptoms of the 'mal secco' disease of citrus appeared 19 days after syringe injections of pycnidiospore suspensions of *Deuterophoma tracheiphila* [*R.A.M.*, xxvi, p. 143] into the peripheral wood ring of the stock of young bitter orange trees. This rapid appearance was attributed to the fact that the fungus was brought into direct contact with the host tissues without the latter suffering the functional disturbances and anatomical modifications which are likely to occur after wound inoculations and prevent the penetration of *D. tracheiphila*. The fact that the rapid effect of pycnidiospore injection seems to be related to their direct introduction into the ascending sap stream is analogous with the results obtained by using other agents causing tracheomycosis.

Phytophthora disease of Citrus.—*Agric. Gaz. N.S.W.*, lviii, 8, pp. 417–419, 3 figs., 1947.

Most metropolitan citrus nurseries in New South Wales are attacked by *Phytophthora* [*R.A.M.*, xxii, p. 133], and there is a danger of the disease spreading through infected stocks to newly established areas. Recommended precautionary measures are the elimination of diseased material, selection of site, crop rotation, and spraying.

The disease caused by *P. citrophthora* and other *P.* spp. was proclaimed under the New South Wales Plant Diseases Act on 25th May, 1947. Any person who knowingly offers for sale or sells citrus trees infected with any of the disease phases (collar rot, root rot, or stem girdle) is liable to a penalty under section 26 of this Act.

Gadd (C. H.) & Loos (C. A.). **The ambrosia fungus of Xyleborus fornicatus Eich.**—*Trans. Brit. mycol. Soc.*, xxxi, 1–2, pp. 13–18, 1 pl., 26 figs., 1947.

The female shot-hole borer of tea, *Xyleborus fornicatus* [*R.A.M.*, xxii, pp. 205, 498], causes great damage in Ceylon by boring galleries in living tea stems. In these galleries the young insects are fed exclusively up to pupation on an ambrosial fungus which is named *Monacrosporium ambrosium* n.sp. The beetle also attacks the stems of the castor bean (*Ricinis communis*). The fungus lines the gallery walls with a frost-like dust. It grows well on malt agar and Waksman's agar without acid at room temperature. The thin, hyaline, septate and branched vegetative hyphae are found in the purple-stained wood adjacent to the galleries and thinly lining their walls and on them small, crowded, erect, septate, normally

nbranched conidiophores are produced. The single, terminal, hyaline, clavate pores, 25 to 51 by 10·5 to 15·5 μ, are non-septate with a rounded apex at first, and ıter and before germination 2- to 5-septate with a bluntly pointed apex.

'ADMANABHAN (S. Y.). **Fusarium sp. parasitic on Epipyrops, a lepidopterous parasite of the Sugarcane Pyrilla.**—*Proc. Indian Acad. Sci.*, Sect. B, xxvi, 3, pp. 77–92, 1 fig., 1947.

A tabulated account is given of the author's cultural and morphological studies n a species of *Fusarium* attacking the pupae of *Epipyrops*, which in its larval tage is parasitic on *Pyrilla*, a leafhopper pest of sugar-cane. Three isolates were sed, (1) from *Epipyrops*, (2) a monoconidial culture from (1). and (3) a mono-onidial culture from growths isolated from artificially infected *Epipyrops*, of hich (1) and (3) produced both macro- and microconidia, while (2) gave rise only o the latter. Nos. (2) and (3) were grown on seven standard media. Both produced colourless or white aerial mycelium, the stroma being purple or pink in the former nd salmon to salmon-buff in the latter. The predominantly ovoid to fusiform ıicroconidia were generally grouped together in false heads. The macroconidia of ulture (3) had up to 5, rarely 6 or 7, septa. Both macro- and microconidia were roduced in nature. On the basis of its morphological characters the fungus is dentified as *Gibberella fujikuroi* var. *subglutinans*. It did not, however, form clerotia.

As in nature, the fungus was parasitic only on the pupae of *Epipyrops* in inocula-ion experiments, being unable to attack the larvae.

IIDDELHOEK (A.). **Laboulbeniaceae in Nederland II.** [Laboulbeniaceae in the Netherlands II.]—*Ned. kruidk. Arch.*, liv, pp. 232–239, 10 figs., 1947.

This is a critically annotated list of seven species of entomogenous Laboul-eniaceae [cf. *R.A.M.*, xxv, p. 153] collected in the north-east polder of Holland.

'ARADA RAJAN (B. S.) & PATEL (J. S.). **Seed transmission of stem-rot of Jute and its control.**—*Indian J. agric. Sci.*, xvi, 2, pp. 193–206, 1 fig., 1946.

The seed transmission of the jute stem-rot fungus (*Macrophomina phaseoli*) *R.A.M.*, xxiii, p. 107] has been investigated at the Jute Research Laboratories,)acca. Infected seeds bore sclerotia and pycnidia on the whole outer surface, and hen examined microscopically, macerated seed sections also showed sclerotia and ıature hyphae under the seed coat. The infection usually spreads from the leaves f axillary branches to the inflorescences and upwards to the capsules but direct ıfection of the fruit by pycnidiospores may also occur. Infected mature capsules ften split and shed seeds covered with pycnidia. The extent of capsule infection epends upon rains, late rains causing severe infestation. Infected seeds have a ull, often shrunken, surface, compared with the smooth, glossy, brown, healthy eeds.

A seed sample was classified into four groups: (1) with sclerotia, (2) with hyphal rowth only, (3) light and shrivelled, and (4) healthy. Five per cent. of those of roup (4) showed the disease. Nearly 8 per cent. of the seeds were light and hrivelled and of these only 25 per cent. germinated. Those in groups (1) and (2) ither did not germinate or produced diseased seedlings. In ordinary samples more han 80 per cent. of the seeds germinated, but in severely infected ones 40 per cent. ere non-viable and 40 per cent. produced infected seedlings. As previously uggested [loc. cit.], seed-borne infection is more important in the initiation of the isease than soil contamination, but the disease cannot be prevented by using isease-free seeds in heavily infected soils; however, such soils are rare. Extensive eed tests showed that heating the seeds in water at 55° to 60° C. destroys the

pathogen without causing serious deterioration in viability, although deep-seated sclerotia may survive even at 70°. Ceresan, nomersan, and agrosan G proved effective as seed disinfectants, the first two being superior to the third, which controls seed rot but is less effective in preventing seedling mortality.

YARWOOD (C. E.). **Snapdragon downy mildew.**—*Hilgardia*, xvii, 6, pp. 241–250, 3 figs., 1947.

Snapdragon downy mildew (*Peronospora antirrhini*) [*R.A.M.*, xxvi, p. 130] was found by K. P. Baker on *Antirrhinum nuttallianum* at Otay Lake, San Diego County, California, in 1941. All snapdragon varieties inoculated by the author or observed under conditions of heavy natural infection were found to be susceptible [cf. ibid., xxv, p. 454]. In a severe outbreak at Guadalupe, California, in 1940, breeding lines with dark, waxy foliage had fewer infected plants than light-coloured ones. In the United States the disease has been recorded in Oklahoma, Pennsylvania, Oregon, and California, where the author first observed it in May, 1938, on specimens of *A. majus* from Hayward. By 1940 it was severe throughout the San Francisco Bay area and had appeared in southern California, where in 1940–42 infection was so general that it was impossible to obtain healthy seedlings. At a seed farm at Guadalupe, 90 to 95 per cent. of the plants in 1,400 flats were lost in January, 1940, while at a nursery in Los Angeles (in 1942) and another in Oakland about 1,000 flats were discarded because of the mildew.

Under suitable conditions, symptoms [ibid., xvi, p. 815] may appear only four days after inoculation. Systemic infection of seedlings shows as a downward curling, paling, and rosetting of the leaves, with stunting of the plant, while local infections, which are not important, cause pale green areas with diffuse margins. Recovery from systemic infection is often accompanied by the formation of non-infected shoots. If plants become infected when about to flower, rosetting of the growing point results.

P. antirrhini, distinguished by its branched haustoria, produces numerous oospores 30 to 33 μ in diameter in the cortex of systemically infected plants. The sporangia germinate with the production of a germ-tube. The optimum temperature for the fungus is about 10° C., and high humidity is necessary for infection. Epidemics are associated with dark, foggy, and rainy weather and heaviest artificial infection occurred in a moist chamber in an unheated greenhouse. In the author's opinion, a great deal of the infection in commercial greenhouses is due to the contamination of healthy plants during transplanting. Sporangia are transferred on the workers' hands from infected to healthy plants. On two occasions heavy infection developed in flats about one week after transplanting.

Exposure of inoculated plants to an air current from an electric fan prevented infection in an unheated greenhouse, though similar plants not so exposed showed 52 per cent. infection. Control was also demonstrated by the application of vapour from paradichlorobenzene crystals, by sulphur dusting, and by spraying with resin lime-sulphur. In three typical tests in commercial nurseries, resin lime-sulphur spray at three- to eight-day intervals from the time of emergence averaged 82 per cent. control, sulphur dusting at three-day intervals giving almost as good results.

BEIJER (J. J.). **Het 'spouwen' der Hyacinthen.** ['Loose bud' of Hyacinths.]—*Meded. LandbHoogeschool Wageningen*, xlviii, 5, pp. 187–225, 15 figs., 6 diags., 1947. [English summary.]

'Loose bud' is the name applied to the falling-out of hyacinth inflorescences shortly before flowering time. The trouble, which chiefly affects the commercial Blue Bismarck and Pink Pearl varieties, may remain quiescent for several years and then suddenly develop on a large scale throughout the bulb-growing area of

Holland, with resultant losses of 50 per cent. or more of the inflorescences. Even heavier losses are experienced under glass.

A perusal of the relevant literature since 1752 revealed no suggestion of a parasitic organism as an etiological factor in the production of 'loose bud'. An intensive study of Bismarck at the Bulb Research Laboratory, Lisse, showed the dropping-out of the inflorescence to be merely the last link in a chain of processes, of which the most important, the break in the flower stalk, takes place in late January or early February, i.e., long before the emergence of the young shoot under outdoor conditions. The first perceptible symptom is a sap infiltration into the bulb disk and flower stalk, causing a water-soaked appearance. In severe cases the flower stalks contain a narrow, longitudinal cavity from which arise several radial fissures, and small transverse cavities. At this juncture the expanding leaves, tightly clasping the inflorescence, induce an upward tension in the flower stalk and a consequent tendency to break off at one of the transverse cavities. However, infiltration is not always succeeded by breaking of the flower stalks, and once the shoots emerge and are able to transpire, they rapidly recover and make normal growth unless the flower stalks have sustained serious damage.

'Loose bud' would appear to be a concomitant of bleeding, consequent on relatively excessive root pressure and manifested, *inter alia*, by the presence of bleeding sap in the cavity between the two ends of the severed flower stalk. The disorder is promoted by all factors directly or indirectly stimulating root pressure, e.g., precocious root development due to (1) insufficient heat during the summer treatment of the bulbs, (2) unduly early planting, and (3) too high a soil temperature in the glasshouse immediately after planting; and excessive root activity consequent on (1) overheating of the soil (5° to 7° C.) during the winter, (2) excess soil water, and (3) autumn applications of an ammonium sulphate fertilizer (influencing permeability). High root pressure, however, will not induce infiltration unless accompanied by a sufficiently sharp check to transpiration and water consumption during the brief 'sensitive period' in the plant's development when the elongation of the young shoot cannot keep pace with root growth.

Decay, frequently occurring later in the residual stump of the flower stalk, tends to progress into the stem just below the point of development of the new inflorescence. For this reason bulbs that have suffered from 'loose bud' in the preceding year may produce inferior flowers.

Control measures should be based on avoidance of the factors listed above as calculated to further the disorder through an increase of root pressure. Hence they should include storage of the bulbs at an appropriate temperature (about 25·5°) until planting time to forestall precocious root development; late (end of November) and relatively shallow planting; omission of ammonium sulphate from the autumn soil amendment programme; and the provision of adequate drainage. Bulbs to be forced for the Christmas market require in addition special treatment, comprising a low temperature during storage in September, early planting, and maintenance of a moderate soil temperature. A high incidence of 'loose bud' in forced hyacinths was frequently correlated with a very early break in the flower stalk, i.e., at the beginning of December before transference of the bulbs to the forcing house. Further observations are necessary to ascertain whether the break can also occur during the forcing period itself.

Carrera (C. J. M.). **Estudio de una nueva enfermedad del Gladiolo en la República Argentina.** [Study of a new *Gladiolus* disease in the Argentine Republic.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, iii, 34, 6 pp., 1 fig., 1947.

Fusarium oxysporum var. *gladioli* was isolated on standard media from samples of Picardy *Gladiolus* corms [*R.A.M.*, xxiv, p. 418] from different parts of Argentina

in 1943. Inoculation experiments on healthy corms resulted in the development of typical lesions, from which the fungus was reisolated.

Petrak (F.). **Über eine wenig bekannte, durch Colletotrichum cliviae (Oud.) Petr. verursachte Blattfleckenkrankheit der Clivien.** [On a little known leaf spot disease of Clivias caused by *Colletotrichum cliviae* (Oud.) Petr.]—*Sydowia* (*Ann. mycol., Berl.*, Ser. II), i, 1–3, pp. 80–82, 1947.

Clivia plants in a Weisskirchen (Czechoslovakia) nursery were destructively attacked by a fungus which produced on the leaves grey to greenish or brown, mostly diffuse, coalescent lesions, water-soaked at first, later drying and turning pale yellow or grey-brown, the lower parts often dark red or leather-brown, eventually covering wide areas or the whole of the lamina and causing a wet rot. The pathogen was shown to be a typical *Colletotrichum*, which was originally described by Oudemans from Holland in 1896 (*Verh. Akad. Wet. Amst.*, v, p. 226) as *Chaetostroma cliviae* Oud. and should henceforth be known as *Colletotrichum cliviae* (Oud.) Petr.

Roberts (Winifred O.) & Landau (N.). **Multiple mineral deficiencies in fruit trees : injection as first aid treatment.**—*J. Pomol.*, xxiii, 1–2, pp. 80–91, 1947.

This study deals with experimental injections with solid nutrients [*R.A.M.*, xxiv, p. 334] into apple trees suffering from serious and widespread die-back due to deficiency of potassium and one or both of the trace elements, manganese and iron [ibid., xxv, p. 119].

On 7th March, 1945, Crimson Cox, Cox's Orange Pippin, D'Arcy Spice, and Bramley's Seedling trees in Essex received trunk, and the last-named variety branch injections. By June the leaves of all trees receiving iron were greener than the untreated ones, and those injected with iron and potassium were a deeper green than those injected with iron alone. The improvement became even more evident at the end of July. In another locality Cox's Orange trees showing acute deficiency improved on injection with potassium and manganese or with potassium and iron. Cox's Orange and Worcester Pearmain trees with severe die-back and Early Victoria exhibiting serious leaf scorch showed an improvement after receiving potassium and phosphorus, and those injected with iron showed richer, darker green foliage later. The best results were obtained with iron (ferrous) sulphate alone, which brought about a great increase in the potassium content of the leaves.

In another experiment young Cox's Orange Pippin trees affected with severe leaf scorch showed the greatest increase in potassium content when injected with potassium sulphate plus iron sulphate.

Groves (A. B.). **Comparative effect of lime-sulphur and flotation sulphur on tree growth and fruit yield.**—*Tech. Bull. Va agric. Exp. Sta.* 103, 12 pp., 1 col. pl., 1946.

When young, bearing Starking Delicious apple trees were sprayed with lime-sulphur and flotation sulphur [*R.A.M.*, xxvi, p. 549] over a period of five years to determine their effect on fruit yield and tree growth, the trees given flotation sulphur significantly outyielded those treated with lime-sulphur in the four years that a crop was produced. The increase is attributed to the greater fruit set. Both materials gave excellent control of scab [*Venturia inaequalis*].

McKay (R.). **Observations on the development of Apple canker.**—*Gdnrs' Chron.*, Ser. 3, cxxi, 3136, pp. 53–54, 1947.

In 1929 a plot of apple trees interplanted with black currants was laid down at the Albert Agricultural College, Glasnevin, Dublin, consisting of the Worcester Pearmain, Laxton's Superb, Charles Ross, Allington Pippin, Early Victoria, Lord

erby, Lane's Prince Albert, Grenadier, and Newton Wonder varieties on East alling stocks I, II, IX, XIII, and XVI. Farmyard manure was liberally applied very year up to 1936. Canker (*Nectria galligena*) was troublesome from the eginning, developing in a severe form on every tree of Lord Derby (of which only ne out of ten survived, on stock XVI), Charles Ross, and Worcester Pearmain, hile Lane's Prince Albert and some of the Newton Wonders also sustained heavy amage. The stocks appeared to exert little influence on the disease [cf. *R.A.M.*, iii, p. 708; xv, p. 726].

The first row of Worcester Pearmains was near the edge of the plot opposite to hich, at a distance of 6 yds., were two Lord Derby trees planted in 1903–4, 1 yds. apart. Notwithstanding their exposure to infection by the diseased earmains, these two trees remained healthy until 1940, when a heap of manure as made near one of them and left for some time *in situ*, the seepage from it raining in round the base of the tree. Canker was first detected on this tree in 945, and in December, 1946, 78 lesions were counted, 35 of which bore perithecia n abundance. Two of the lesions were on eight-year-old wood (the oldest infected), ne on seven-year, and the rest on six- to three-year-old growth. Besides forming hese typical cankers, some of which were girdling the branches, the fungus had illed 15 to 20 per cent. of the young growth. The evidence points to a lowering f the resistance of the tree near the manure heap through a disturbance in the soil utrient balance, probably from an excess of nitrogen. The other Lord Derby ree was still entirely free from the disease at the time of writing, despite ontinuous exposure to infection and extensive infestation for many years by the oolly aphis [*Eriosoma lanigerum*], the attacks of which are commonly alleged to acilitate the ingress of the pathogen [cf. ibid., ii, p. 318].

'HAFF (S. K.). **Verspreiding van schimmels door de wonden van ongerooide stronken.** [Spread of fungi through wounds on stumps left *in situ*.]—*Fruitteelt*, xxxvi, 4, p. 25, 1946.

During the German occupation of Holland many thousands of wayside trees in arious provinces, especially Zeeland, were felled for use in aeroplane construction. n course of time the stumps, most of which were left *in situ*, became covered with he purple fruit bodies of the silver leaf fungus [*Stereum purpureum*: *R.A.M.*, xxv, . 68], thereby serving as a prolific source of contamination for neighbouring rchards. Owners are urged to clear away the infected debris at an early date.

HUGH SMITH (W.). **Extending the storage life of the Victoria Plum.**—*J. Pomol.*, xxiii, 1–2, pp. 92–98, 1947.

The results of these experiments at East Malling Research Station show that the nternal browning of mature Victoria plums stored at 31° F. immediately after icking can be successfully avoided by transferring the fruit for two days to 65°, t some point between the 15th and 20th day of storage. The plums ripened ormally after further storage for 15 to 20 days at 31°, after which browning set in, hough to a lesser degree than in the controls. Browning of less mature fruit was nly partially controlled after 50 to 51 days at 31°.

WILSON (E. E.). **Depositional and weather-resisting qualities of some copper fungicides affecting the control of Peach blight.**—*Hilgardia*, xvii, 6, pp. 227–238, 1 fig., 4 graphs, 1947.

A description is given of spraying tests carried out in California over three seasons o compare the depositional and weather-resisting qualities of Bordeaux mixture nd three fixed copper fungicides (with and without a proprietary adhesive) used gainst peach blight (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*: *R.A.M.*, xii, p. 440; xxvi, pp. 229, 344]. The results showed that, in proportion to the

amount of copper present, the fixed copper sprays (basicop, zinc coposil, and yellow cuprocide) deposited 29 to 49 per cent. more copper than did Bordeaux mixture.

Laboratory tests of deposition on glass slides coated with cellulose nitrate demonstrated that the amount of liquid deposit of Bordeaux mixture retained by the surface was in direct proportion to the length of the application period up to the time when the liquid began to run from the vertically held surface, after which it decreased and eventually reached a stage where the deposit remained approximately constant. In some cases, the loss of copper resulting from run-off was 40 per cent. of the deposit present just before run-off started.

The addition of an unemulsified petroleum oil to Bordeaux mixture increased the amount of copper deposit retained by the surface at the run-off stage, a longer period of application being necessary to cause the liquid to run from the surface.

Water suspensions of the fixed copper fungicide wetted cellulose nitrate less readily than did Bordeaux mixture, the amount of liquid retained by vertical surfaces at the run-off stage being greater than when Bordeaux mixture was used. When, however, the proprietary supplements (basi-spread and ortho-adhesive), or one containing a petroleum oil emulsified with ammonium oleate was added to these suspensions, copper was retained in increasing amounts as application continued after the run-off stage, the fungicide being apparently held in the oil globules.

Loss of deposit by weathering was determined in the orchard. In three seasons (rainfall averaging 8·59 in.) the tenacity coefficients (the ratio of residual spray deposit to the initial spray deposit) were: Bordeaux (10–10–100) 0·239, Bordeaux plus ortho-adhesive 0·348, zinc coposil (vapour application) 0·345, cuprous oxide 0·239, zinc coposil (applied with regular spray apparatus) 0·222, and basicop 0·207. All the fixed copper preparations were combined with the supplements.

While all the preparations reduced twig infection considerably, Bordeaux plus ortho-adhesive and the zinc coposil vapour application appeared to be somewhat more effective than the others. The amount of copper remaining on the tree throughout the winter was not invariably correlated with the degree of control of twig infection. The reason for this has not yet been definitely ascertained.

Hart (R.). **The new Merton Cherries.**—*J. Pomol.*, xxiii, 1–2, pp. 112–116, 3 pl., 1947.

At the Kent Farm Institute, where 13 new seedling cherries developed by M. B. Crane at the John Innes Horticultural Institution were being grown in comparison with commercial varieties, the effect of natural infection by bacterial canker (*Pseudomonas mors-prunorum*) [*R.A.M.*, xxiv, p. 155] was investigated. The test was severe because the Merton cherries were ground-level worked whereas the commercial varieties were grafted at standard height. Five of the Merton seedlings, 185, 193, 404, 418, and 490, have been selected by the National Fruit Trials Committee for further trial.

The mortality percentages from 1934 to 1943 were: Merton Heart (404) 8, Governor Wood 22, Merton Bounty (490) 25, Early Rivers 27, No. 573 29, No. 414 33, Roundel 38, Merton Bigarreau (193) and Merton Favourite (185) 44, Waterloo 56, and Merton Premier (418) 67. Merton Heart (seedling 404; Bigarreau Schrecken × Elton Heart) possesses the highest degree of resistance both to bacterial canker and to blossom wilt (*Sclerotinia laxa*) [ibid., xxiv, p. 456].

Magee (C. J.). **Root diseases of the Banana.**—*Agric. Gaz. N.S.W.*, lviii, 8, pp. 419–422, 5 figs., 1947.

In New South Wales banana wilt or Panama disease (*Fusarium oxysporum* var. *cubense*) [*R.A.M.*, xxiii, p. 80], though rather widespread, is of little economic

importance because of the cultivation of resistant varieties (Cavendish, Williams Hybrid, Mons Marie). It occurs only on Lady's Finger, Sugar, and plantains. The most common banana root disease is caused by *Rhizoctonia* [*Corticium*] *solani* ibid., i, p. 274; v, p. 112], which kills the laterals and produces cankers on the cord roots. The growth of new roots behind the diseased region usually offsets the damage caused by the fungus. Very severe outbreaks of the disease, which occur mostly during the late summer and early autumn after heavy rain, have often caused stunting of the shoots, foliar yellowing, and shrivelling and blackening of the fruit. The cord and lateral roots of such plants were severely rotted and also the outer cortical layer of the corm. In some cases a *Pythium* sp. has been isolated from the roots and from dark grey, discoloured areas deep in the cortex of the corm. The destructive outbreaks of the disease have always occurred where previously there had been infertile grassland. The plants were of low vitality and grew slowly owing to insufficient nitrogen supply; in these the dark grey cortical discoloration was absent. Applications of ammonium sulphate (2 oz. to each young plant at six-week intervals from August to April) are recommended.

Jardim Freire (J. R.). **Uma seria doença da Bananeira 'mal do Panamá'.** [A serious disease of the Banana, 'Panama disease'.]—*Bol. Agron., Pôrto Alegre*, x, p. 256, 1946.

The fungus isolated from wilted bananas in the vicinity of S. Leopoldo, Rio Grande do Sul, Brazil, in 1946, was identified by C. J. M. Carrera of the Argentine Institute of Plant Hygiene, as *Fusarium oxysporum* var. *cubense*. One of the varieties affected was the reputedly resistant Nanica [Dwarf or Cavendish], the other the susceptible Maça [Club]. Other varieties alleged to be resistant are Cumprida [Perfect] and S. Thomé, while the susceptible category includes Prata [Silver] or Santa Catarina, Ouro [Golden], and Roxa [Violet].

Batista (A. C.). **Mal do Recife (grave doença da Mangueira).** [Recife sickness (a serious disease of Mango).]—Thesis, Pernambuco College of Agriculture, viii+106 pp., 5 figs., 1947. [English summary.]

The so-called 'Recife sickness', of which the author has made an exhaustive study, is stated to be responsible for very heavy damage to mango trees in the capital of Pernambuco, Brazil. Of 20,868 trees examined up to the time of writing, representing nearly one-sixth of the total mango population of the city, 5,640 (27·03 per cent.) were so severely affected that their death was to be expected within three or four months. The causal organism, *Diplodia recifensis* n. sp., is introduced into the trees by its insect vector, *Xyleborus affinis*, and develops rapidly in the galleries made by the latter in the stem; thence it passes into the surrounding tissues, finally reaching the xylem vessels, in which a brown or black radial discoloration develops, and cuts off the supply of water to the foliage. The first symptom is the exudation of gum from the perforations made by the beetle in its ingress into the stem; wilting ensues and the trees collapse after a varying period according to the season, brief if infection occurs in the summer and longer in the case of an autumn attack.

The fungus grows well at pH 6·8 to 7·5 on various synthetic and natural media, among which potato dextrose agar was particularly suitable for the observation of morphological characters. The temperature range for normal development and chromogenesis lay between 27° and 37° C., no growth occurred at 45° or in cultures maintained in the refrigerator. The erect conidiophores, 12 to 18 by 2·5 to 2·7 μ, arising from the well-developed hyaline, septate mycelium, are reminiscent of synnemata but produce 'radula' spores [Mason in *Mycol. Pap. Imp. Mycol. I.* 3, p. 9]. With advancing maturity the conidiophores disappear, to be replaced by pyriform, globose, ostiolate, carbonaceous, smooth or echinulate pycnidia, 260 to 390 by

195 to 299 (mean 315 by 277) μ. From these organs develop hyaline amerospores, 16·1 to 28·3 by 16·2 (22·3 by 14·5) μ, and later elliptical, uniseptate, dark brown, smooth didymospores, 21 to 26·7 by 13 to 15·7 (23·7 by 13·9) μ. The development of the pycnidial state is accompanied by a brown to violaceous coloration of the mycelium. All attempts at the production of perithecia gave negative results. A comparison of the mango fungus with other species of *Diplodia*, notably *D. cacaoicola* [*D. paradisiaca*: *R.A.M.*, xxiii, p. 361], *D.* [*Botryodiplodia*] *theobromae*, *D. mangiferae* [ibid., vi, p. 580], and *D. natalensis*, gave no grounds for its identification with any of them, and a new species was accordingly erected as indicated above.

D. recifensis proved to be a very weak pathogen on two-year-old mango trees unless introduced simultaneously into upwards of 15 perforations in the stem, thereby simulating its joint operation with *X. affinis* under natural conditions. This method of inoculation resulted in the development of infection in three months and the decline or collapse of the trees in five. In the insect galleries the fungus produces only mycelium and radula spores, which adhere to the exterior of the beetle and are thus disseminated from one infection focus to another.

The relationship between fungus and insect is very close. At no stage in its life-history does *X. affinis* consume wood, and its nutrient requirements are supplied by *D. recifensis*, which is rich in nitrogenous substances and vitamins and should be included, therefore, among the ambrosia fungi [cf. above, p. 70]. Two types of bacterial symbionts, a small rod and a coccus, occurring in a mycetome situated in the middle of the posterior intestinal tract, are believed to assist in the ingestion of the fungal nutrients by the beetle. The bacteria flourish in the mycetome and may multiply so freely as to threaten the existence of the insect. They are, however, themselves parasitized by another inmate of the mycetome, a nematode of the *Anguillulina* type found in the larval stage only. After demolishing the bacterial symbionts the nematode in its turn enters upon a parasitic phase injurious to the insect. These associations raise new problems in the field of hyperparasitism.

The 'Recife sickness' is incurable, but its further spread may be arrested by the eradication of diseased trees and the application to the stems and branches (down to 3 cm. in diameter) of their healthy neighbours of an oil C and 5 per cent. phenol mixture. The felled trees should be lightly charred with paraffin, to forestall the flight of the beetles, before cutting into logs for firewood and removal from the orchard.

Moore (W. C.). **British fungi.**—*Trans. Brit. mycol. Soc.*, xxxi, 1–2, pp. 86–91, 1947.

Descriptions given of fungi found in Britain [*R.A.M.*, xxvi, p. 172] from 1928 to 1946 include the following. *Sphaerotheca fuliginea*, found in Kent and Bedfordshire and probably widely distributed on cultivated *Doronicum*, has perithecia measuring 81 to 96 (average 87) μ in diameter and asci 62 to 72 by 51 to 55 (average 67 by 52) μ with six to eight ascospores. An *Oidium* sp. was severe on *Antirrhinum majus* at Shrewsbury after planting out. The almost rectangular hyaline conidia were 24 to 45 by 12 to 17 (average of 40 spores 30 by 14·5) μ. *Leptosphaeria heterospora* has been found to cause a decay and discoloration of the roots and rhizomes of *Iris germanica* in Surrey, London, and Buckinghamshire, and of *I. pumila formosa* in Kent. The fungus attacks weak plants, causing withering of the older and die-back of the younger leaves. Numerous black perithecia are usually found embedded in the under side of the rhizomes. Scattered, small immersed pycnidia of *Phyllosticta camelliaecola* var. *meranensis* have been observed on living leaves of *Camellia* in Hertfordshire. The spores, agreeing with those of Bubák's variety (*Öst. bot. Z.*, lxxx, 1905), measure 3 to 5 by 1 to 1·5 μ. A branch of a six-year-old apple tree in Yorkshire infested by other organisms was observed

to bear pycnidia of *Sphaeronema pruinosum* (*Pezicula pruinosa*) containing both macro- and microspores. The larger, measuring 16 to 27 by 9 to 12 (average of 20, 23 by 10) μ in nature and up to 30 μ long in culture, were mixed with numerous hyaline, unicellular, filiform spores 6 to 13 by 1 to 2 (average length of 20, 9·3) μ. The fungus was very similar to *Glutinium macrosporum* [ibid., xv, p. 117], differing only in the larger size and septation of the spores in culture and the production of pycnidia on apple fruits slowly rotted by the fungus. Round or subangular spots caused by *Ascochyta bohemica* [ibid., xix, p. 597] on the leaves of *Campanula medium* in Hertfordshire were 2 to 10 mm. in diameter, at first epiphyllous and later visible on both sides of the leaf, brown, dry, and with a broad purple margin 2 mm. wide. The pycnidia were few, producing mainly uni-, occasionally bicellular, biguttulate spores 12 by 6 μ. Basal stem rot, causing heavy losses among potted cineraria plants in Lancashire and Bedfordshire, was found to be due to *A. cinerariae* [ibid., xv, p. 443; xxv, p. 166]. The numerous pale brown, thin-walled, parenchymatous, erumpent, globose or lens-shaped pycnidia measured 180 to 250 (to 300) μ with an ostiole 25 to 35 μ in diameter. The spores were hyaline or slightly coloured, ovoid, 6 to 10 by 3 to 5 μ, mostly uniseptate when mature. *Cercosporella primulae* has been observed on living leaves of *Primula wanda* in Staffordshire and on hybrids of *P. juliae* in Herefordshire and Hampshire [ibid., xxi, p. 141]. In Norfolk and Wiltshire *Fusicladium lini* [ibid., ix, p. 16] was found to cause a yellowing and slow wilting of young flax plants, a black coating being formed on the lower leaves and wilted cotyledons. The simple, usually fasciculate, septate, pale brown conidiophores measure up to 200 μ long and are 3 to 6 μ broad. The pale, continuous or uniseptate, subcatenulate spores, borne singly at the tips or occasionally pleurogenously, are mainly straight or sausage-shaped, with a minutely apiculate wall 1 μ thick, and measure 12 to 37 by 5 to 9 (average of 25, 24 by 7) μ.

Bouriquet (G.). **Les maladies des plantes cultivées à Madagascar.** [The diseases of cultivated plants in Madagascar.]—Encycl. mycol., xii, 545 pp., 49 pl. (7 col.), 230 figs., Paris, Paul Lechevalier, 1946. Fr. 1,800.

In this important work, the result of ten years' studies and observations by the author in Madagascar, many of which have been noticed from time to time in this *Review* [cf. *R.A.M.*, xviii, p. 11], the first part (pp. 15–136) deals in broad outline with the history of plant pathology and the present state of the science, describes the geological formation, climate, vegetation, soils, and crops of Madagascar, treats of plant diseases and their causes in general, gives a long account of fungi, bacteria, and Myxomycetes (pp. 38–96), discusses in detail methods of disease control, the different types of apparatus used in the application of fungicides, and shows how to prepare and pack phytopathological specimens for dispatch. The second part (pp. 137–519) deals with the diseases occurring in Madagascar on 57 hosts, which are grouped under industrial and auxiliary plants, fruit, market-garden plants, and ornamentals, each account treating [where known] of the symptoms of the disease, the characters of the causal organism and its geographical distribution, the effect on the disease of such factors as climate, soil, methods of cultivation, and varietal resistance, and control; each host section is followed by a bibliography.

All varieties of coffee grown in all parts of Madagascar are affected at all seasons by *Hemileia vastatrix*. The most susceptible species, *Coffea arabica*, has now been replaced in the eastern coastal regions by the more resistant *C. liberica*, *C. kouillon*, *C. robusta*, and *C. congensis*. The disease has been present probably since 1872 and certainly since 1886. *Glomerella cingulata* was first observed by the writer (on *C. arabica* leaves) in 1936, near Itasy [cf. ibid., xiii, p. 506].

Cassava mosaic [ibid., xii, p. 352] was noted by the author in 1929 near Antananarivo, but was said to have been long present in the island. It then caused no anxiety. A few infections were seen in April, 1930, near Lake Alaotra, where it

spread rapidly in 1935, 1936, and 1937. The Malgache variety is very susceptible, but Madras shows satisfactory resistance. There seems to be some correlation between a red shoot pigment and resistance.

Cacao in the eastern part of the island often shows a serious branch canker due to *Calonectria rigidiuscula* [ibid., xxv, p. 548]. With the perithecia of this fungus were found the perithecia of *Nectria cacaoicola* [ibid., xiv, p. 397].

Alternaria tabacina (with which the author regards *A. longipes* as synonymous) has been recorded previously on tobacco [ibid., xvi, p. 590]. The beaked conidia measure 50 to 105 by 10 to 19 μ. Locally, the Valencia groundnut variety is very susceptible to *Cercospora personata* [see above, p. 66], though Buitenzorg is moderately resistant.

In December, 1935, the author received from Lake Alaotra young soy-beans killed by a disease the causal organism of which, characterized by a septate mycelium 3 μ in diameter present in the base of the stem, flattened pycnidia 108 to 150 μ in diameter and non-septate, cylindrical stylospores, rounded at the ends and measuring 3 to 5·5 by 2 to 2·5 μ, is named *Coniothyrium sojae* n. sp. [without a Latin diagnosis].

Voandzeia subterranea has been widely affected by powdery mildew which the author names *Sphaerotheca voandzeiae* [n. sp.]. The superficial hyphae measure about 7 μ in diameter and penetrate the epidermal cells with haustoria having truncated extremities and measuring 25 to 45 by 13 to 19 μ. The dark chestnut perithecia are 73 to 105 μ in diameter. The subglobular asci measure 45 to 53 μ in diameter and contain four oval, hyaline ascospores 25 by 16 μ. Parasitic on the conidiophores of the fungus, pycnidia of *Cicinnobolus cesatii* [ibid., xxiv, p. 476] were found. *Cercospora voandzeiae* [n. sp.] causes a leaf spot of *V. subterranea*; the mostly 3-septate, hyaline spores, broad at one end and tapering at the other, measure 29 to 64 by 4 to 5·25 μ. No control measures are at present necessary.

There is no record of wheat rust in Madagascar before 1912, when heavy losses were sustained from this cause, though the disease had probably been present for many years. In the region of Antsirabe, in 1911, 30 tons of seed were distributed and the yield was 230 tons; in 1912, when *Puccinia triticina* appeared, from 60 tons of seed, the yield was 280 tons; in 1913, when the second outbreak occurred, the figures were 70 and 79, respectively. In 1932, near Lake Itasy, the author found *P. graminis* and *P. glumarum*, identified in 1915 by Peyrot. In 1933, Aurore wheat plants from Antsirabe bore *Ustilago tritici*; at present, the disease appears to be still confined to this locality. In 1937, *Helminthosporium gramineum* was also observed on wheat, but the disease is of no economic importance locally. In 1934, *P. coronifera* [*P. coronata*] and *U. avenae* were found on oats, while in 1935 the same host was attacked by *Sclerotium rolfsii*.

On several occasions since 1930, *Pelargonium capitatum* has been attacked by an anthracnose due to a fungus which in culture produced conidia measuring 5·25 to 15 by 4·2 μ, and on inoculated shoots brown, hairy, more or less piriform perithecia, 380 by 250 μ containing asci measuring 56·5 by 9 μ with eight curved, hyaline ascospores 12·5 to 19 by 3·5 to 7 μ. The species is named *G. vanillae* var. *pelargonii* [n. var.].

In 1937, young *Eucalyptus obliqua* plants showed a leaf-withering due to a fungus with perithecia measuring (in nature) approximately 74 by 64 μ and asci without paraphyses, widened at the base and measuring approximately 42 by 9 μ; these contained eight hyaline ascospores measuring 10 by 2·5 μ, divided somewhat unequally by a transverse septum. This fungus is named *Mycosphaerella heimii* n. sp.

Apples are attacked by *G. cingulata*. Vines are affected by *Plasmopara viticola*, the *Isabelle* variety (*Vitis labrusca*) being severely attacked, though a Couderc hybrid (probably no. 13) appears to be resistant.

Potatoes have not, so far, been affected by *Phytophthora infestans* and no definite cases of degeneration diseases have been observed, though mosaic of the 'frisolée' type was noted in 1941. The most serious losses are caused by *A. solani*, first observed locally in 1929.

Eggplants sustain heavy losses from a rust, first reported in 1926, caused by a fungus which the author names *Puccinia angivyi* [n. sp.]. The disease occurs during the dry season. An abundant, irregular, hyaline, septate mycelium approximately 4 μ in diameter is present in the affected tissues. The globular aecidium, closed when young, measures about 215 μ, and after opening out 630 by 420 μ. The aecidiospores measure 16·5 to 26·5 by 14·5 to 19 μ. Bicellular teleutospores with a long, hyaline, fragile pedicel are sometimes present; they measure (without the pedicel) 35·5 to 52·5 by 21 to 27 μ.

Incompletely developed eggplant fruits on young plants the cultivation of which had been abandoned showed (November, 1937) a dry rot followed by mummification. The hyaline, intercellular, septate mycelium, about 3·5 μ in diameter, gave rise in the region of the epidermis to small stromata bearing tufts of conidiophores measuring 70 by 4·5 μ. The large, oval, brown, muriform conidia measured 16 to 38 by 8·5 to 23 μ. From one to six transverse septa were present. The name *Macrosporium poissoni* n. sp. is proposed for this fungus.

Strawberries in all parts of Madagascar are attacked by *Mycosphaerella fragariae* in the conidial state, *Ramularia tulasnei*.

In 1935, cultivated roses near Bealanana bore tawny leaf spots sometimes over 1 cm. in diameter. Infected material contained a slightly coloured, septate mycelium 3 to 4 μ in diameter. The perithecia measured 85 by 80 μ. The asci, which had no paraphyses, were round, thickened at the top and broad at the base, measured 43 by 11 μ, and contained eight hyaline ascospores, 14 to 17 by 3·5 to 4 μ, with a transverse septum dividing them unequally. The fungus is named *Sphaerella rosigena* var. *madagascariensis* n.var., the ascospores being larger than those of the species.

The following are recorded, apparently for the first time in Madagascar: *Entyloma dahliae* and mosaic [*Dahlia* mosaic virus] on *Dahlia*, *C. beticola* on beet, *Corticium koleroga* on coffee, *H.* [*Pyrenophora*] *avenae* on oats, *Septoria lycopersici* on tomato, and (?) *Bacterium* [*Xanthomonas*] *citri* on citrus.

Henry (B. S.). **The viability of yeast cultures preserved under mineral oil.**—*J. Bact.*, liv, 2, p. 264, 1947.

Seventeen cultures of yeasts, used in the preparation of wines, covered with sterile mineral oil [cf. *R.A.M.*, xxvi, p. 481], yielded good growth after seven years and agreed with the descriptions made when the cultures were set up.

Macdonald (J. A.). **An improved technique for the study of living mycelium.**—*Trans. Brit. mycol. Soc.*, xxxi, 1–2, pp. 92–93, 1947.

The author has improved his modification [*R.A.M.*, xvi, p. 716] of Sass's technique [*Amer. J. Bot.*, xvi, pp. 663–701, 1929] for studying living mycelium, particularly the clamp-connexions in Basidiomycetes. A large glass cover-slip carrying a nutrient agar film is inverted in a brass box-frame made to measure and set on an extra thin microscope slide. The film cultures on 1·5 per cent. malt in 1·5 per cent. British agar are grown in Petri-dish damp chambers and are removed for examination resting on the brass box mounted on the slide. In this small damp chamber the fungus continues to grow for hours and the formation of clamp-connexions has been repeatedly observed under an oil-immersion lens in *Coniophora puteana* and *Marasmius androsaceus*, the clamp forming in about 20 minutes during daylight hours in the latter species.

Matsumoto (T.). **Application of serology to phytopathology.**—*Arts & Science*, xii, pp. 11–20, 1947.

This survey of the literature on the application of serology to phytopathology falls into four parts dealing with the application of serological techniques to (I) the diagnosis of infectious plant diseases, (II) the differentiation of phytopathogenic bacteria, (III) the taxonomy of phytopathogenic fungi, and (IV) the study of plant virus diseases, with special reference to the differentiation by these means of various tobacco viruses occurring in Formosa [*R.A.M.*, xxvi, p. 422].

Thaysen (A. C.) & Morris (A. R.). **The preparation of microtools for the micromanipulator.**—*J. gen. Microbiol.*, i, 2, pp. 221–231, 1 pl., 8 diags., 1947.

The authors describe the construction of gas and electric forges and various microtools which can be made by means of them, a gas microburner, and a simple hanging-drop micromanipulation chamber for the isolation of single cells.

Barghoorn (E. S.). **Use of phenol formaldehyde and vinyl resins in sealing liquid mounting media on microscopic slides.**—*Science*, cvi, 2752, pp. 299–300, 1947.

The problem of permanently sealing liquid mounting media led to tests which showed a *p*-phenyl phenol formaldehyde resin and a vinyl acetate resin to be very suitable for prolonged sealing of non-corrosive and certain corrosive media. Applied in quantity with a brush or pipette to clean slides, these resins form a seal which remains effective under prolonged storage conditions at normal temperatures. Lactic acid and glycerin preparations, sealed with phenolic resin and stored for eight months at 50° C. with frequent intermittent changes to room temperature showed excellent results. The vinyl resins have not been subjected to similar tests but appear to be equally effective.

The *p*-phenyl phenol formaldehyde compound is sold as a commercial varnish and contains tung oil and a metallic soap as oxidizing agent. The dried and polymerized resin is extremely hard, yet slightly elastic, and exceedingly adhesive to glass. When heated to about 50° it is completely inert to ordinary organic solvents. The resin showed effective sealing of 72 per cent. sulphuric acid after three months storage at 40°. In the case of organic acid media (lactic acid, lactophenol), clouding of the resin may occur at the edges but it does not seem to progress after polymerization of the resin at 50°. These resins should be kept in large containers and drawn off only when needed. In small dropping bottles or similar containers, the resin sets to a permanent gel within a day or two. When still liquid, the resin may be thinned with neutral xylene or ethyl acetate. After resin application, the slides should be dried for 8 to 24 hours and placed in incubators or on warming tables to complete the polymerization, during which the resin becomes amber yellow. This type of phenolic resin is produced by the Bakelite Corporation, New York City. The commercial product (Tufon 74) used by the author is a product of the Brooklyn Varnish Company.

Of the vinyl resins, vinyl acetate proved the most useful sealing compound, though its texture, chemical inertness, and adhesiveness are inferior to phenolic resins. This resin (Bakelite Corporation No. AYAF) may be dissolved to the desired viscosity in 95 per cent. ethyl alcohol, butyl acetate, dioxane, ethylene dichloride, and other organic solvents and used in the same way.

Littman (M. L.). **A culture medium for the primary isolation of fungi.**—*Science*, cvi, 2744, pp. 109–111, 4 figs., 1947.

Because of the many shortcomings of Sabouraud's dextrose agar, especially when used for the primary isolation of fungi pathogenic to man from material containing a mixed flora, the following new culture medium has been prepared, containing in

distilled water, 1 per cent. dextrose, 1 per cent. peptone, 1·5 per cent. ox gall, 2 per cent. agar, 1 to 100,000 crystal violet, and 30 units of streptomycin. The medium minus the streptomycin is distributed in 500 c.c. quantities in 1-l. flasks, sterilized, and stored in a refrigerator. Before use the agar is re-melted and cooled to approximately 46° C. Streptomycin in sterile saline is then added and mixed thoroughly, and the agar poured into Petri-dishes. Many specimens producing only a heavy bacterial overgrowth on Sabouraud's agar developed 30 to 100 well-isolated mould and yeast colonies on the new medium.

Brian (P. W.) & Hemming (H. G.). **Production of antifungal and antibacterial substances by fungi; preliminary examination of 166 strains of Fungi Imperfecti.**—*J. gen. Microbiol.*, i, 2, pp. 158–167, 1947.

The examination of 166 strains of Fungi Imperfecti for their anti-fungal activity was the primary object of this study, their anti-bacterial products also being examined. Substances active against *Botrytis allii* were produced by several species of *Aspergillus* and *Penicillium* [*R.A.M.*, xxvi, p. 23], *Fusarium caerulcum*, *Metarrhizium glutinosum* [*Myrothecium verrucaria* sensu Preston], *Stachybotrys atra*, *Trichoderma viride* [loc. cit.], *Gliocladium catenulatum*, and *Trichothecium roseum*. Substances antagonistic to *Staphylococcus aureus* were produced by species of *Aspergillus*, *Fusarium* [ibid., xxvi, p. 207], *Penicillium*, *Stachybotrys*, and *Trichoderma*.

Smith (G.). **Anti-fungal substances from moulds. II. The effect of patulin on the growth of various plant parasites.**—*Trans. Brit. mycol. Soc.*, xxxi, 1–2, pp. 136–139, 1947.

In further experiments investigating the inhibitory effects of patulin [*R.A.M.*, xxv, p. 551; xxvi, p. 220], derived from *Penicillium expansum* and *P. patulum*, on the growth of various parasitic fungi in Czapek agar cultures, it was found that *Rhizoctonia* [*Corticium*] *solani* was completely inhibited at 1 to 10,000 with little evidence of partial inhibition at dilutions higher than 1 to 20,000. *Sclerotium rolfsii* (on potato dextrose agar adjusted to pH 4·5) was completely inhibited at 1 to 20,000 but grew quite normally at all higher dilutions. Two strains of *Verticillium albo-atrum*, one isolated from a 'progressive' and the other from a 'fluctuating' outbreak on hops [ibid., xxv, p. 140], both gave similar results, inhibition being complete at 1 to 10,000 with progressively more abundant growth from 1 to 25,000 to 1 to 200,000 or more. *Helminthosporium monoceras* was completely inhibited at 1 to 10,000, no visible growth occurring at 1 to 20,000 after 16 days' incubation although most of the conidia had germinated. *H. gramineum* (on potato dextrose agar at pH 4·5) was completely inhibited at 1 to 20,000, growth being retarded even at the highest dilution, 1 to 160,000. *H. sativum* and *Ceratostomella pini* (both on potato agar) were inhibited at 1 to 5,000 and 1 to 20,000, respectively, the growth of the latter fungus being retarded up to 1 to 80,000. The growth of *Botrytis cinerea* isolated from a wilted *Calceolaria* seedling remained apparently unaffected by a 1 to 10,000 patulin concentration, and there was only a slight retardation at 1 to 5,000. In testing *Trichoderma viride* the Czapek agar was definitely pigmented after three days and rapidly turned deep yellow while the controls remained colourless. Patulin in low concentrations in this agar undoubtedly stimulated pigment production [ibid., xxvi, p. 23]. The fungus was able to grow even in the 1 to 5,000 medium.

Gray (W. D.) & Martin (G. W.). **Improvements on the soil burial testing method.**—*Mycologia*, xxxix, 3, pp. 358–367, 5 graphs, 1947.

This is a partial report of the work done in the Jeffersonville Quartermaster Depot laboratory in 1944 and 1945 and is concerned solely with improvements in the soil burial test [cf. *R.A.M.*, xxiii, p. 310], which would minimize the two main

faults, viz., the seasonal effect, and the variation in different soils. In a greenhouse burial test at approximately constant temperature and uniform soil moisture seven days in January, six in April, and only five in June were required to reduce the tensile strength of standard strips of 12·29 oz. grey duck by about 80 per cent. Under more closely controlled conditions, strips of fire-, weather-, and water-resistant (F.W.W.R.) duck were tested in steel soil pans in a controlled humidity chamber. The results of breaking-strength measurements of nearly 1,500 test strips of four different fabrics buried in the same soil at different moisture contents showed that variations in soil moisture caused great variations in rate of loss of tensile strength, the maximum rate of decay occurring at 25 per cent. soil moisture content. Shelter-tent duck treated with water-repellent and buried in soil of 25 per cent. moisture content decayed twice as fast as the same fabric without the water-repellent. Copper-treated F.W.W.R. duck buried in soil pans and in the greenhouse with and without preliminary leaching for 72 hours showed little significant difference between the unleached and leached strips in the greenhouse, whereas in soil pans the leached fabric was entirely destroyed in 24 days while the unleached material lost its tensile strength only after 52.

The soil pan burial method gives much more rapid results and decay tests can be conducted with a high degree of accuracy provided that the soil used has been properly prepared, is biologically active, and is in standard containers where the moisture content can be accurately regulated and maintained and the incubation carried out under closely controlled temperature and relative humidity conditions. It is then a rapid test of great significance, especially when fabrics are the materials to be tested.

Furry (Margaret S.). **Fabrics without mildew.**—*Yearb. Agric. U.S. Dep. Agric., 1943–1947*, pp. 811–814, 1 pl., 1947.

A brief review is given of work carried out at the Bureau of Human Nutrition and Home Economics on the treatment of cotton fabrics against mildew [cf. *R.A.M.*, xxv, p. 410; xxvi, pp. 253, 310], in the course of which over 250 treatments were applied, and the treated material subjected to chemical, physical, and biological tests.

Brien (R. M.) & Dingley (Joan M.). **Rot-proofing of fabrics; comparative experiments using different test fungi.**—*N.Z. J. Sci. Tech.*, B, xxviii, 3, pp. 131–135, 1946.

Since the publication of their previous report on the rot-proofing of fabrics [*R.A.M.*, xxv, p. 176], the authors have carried out further comparative experiments using *Memnoniella echinata* and *Stachybotrys atra* isolated from New Zealand canvas during the previous investigation, and cultures of *Chaetomium globosum* and *Metarrhizium glutinosum* [*Myrothecium verrucaria* sensu Preston: ibid., xxvi, pp. 474, 501] supplied by the Bureau of Plant Industry, United States Department of Agriculture, to determine the fungicidal efficiency of copper oleate, copper and zinc naphthenates, and pentachlorphenol.

The use of different test fungi resulted in significant variations in tolerance of the several rot-proofing chemicals. Thus, on canvas treated with copper naphthenate and copper oleate, *S. atra* was the most tolerant of the four organisms, whereas its growth was inhibited by a lower concentration of pentachlorphenol than that required for *M. verrucaria* and *C. globosum*. More than one fungus, therefore, should be used in tests of rot-proofing compounds.

On untreated canvas inoculated with a mixed spore suspension there were considerable variations in the growth of the individual fungi, except in the case of *Memnoniella echinata*, which predominated throughout. On treated canvas the use of a composite inoculum resulted in control of rotting at lower concentrations

of chemicals than were required in tests of single fungi. The former procedure, therefore, is regarded as unsatisfactory for the assessment of efficiency in rot-proofing preparations.

Goidànich (G.) & Mezzetti (A.). **Ricerche sulla biologia della Melanospora damnosa (Sacc.) Lindau.** [Investigations on the biology of *Melanospora damnosa* (Sacc.) Lindau.—*Ann. Sper. agr.*, N.S., i, 1, pp. 123–139, 1 fig., 1947. [English summary.]

Experiments have shown that the morphological and cultural characteristics of *Fusarium culmorum* and *Melanospora damnosa* [referred to in the first author's earlier paper as *Sphaeroderma damnosum*: *R.A.M.*, xxvi, p. 482] are entirely different. *M. damnosa* grows (and then with difficulty) only on special media consisting of vegetable decoctions, but develops fairly well and produces perithecia on all the media tested in the presence of, or following, *F. culmorum*. It is possible that the auxoheterotrophy of *M. damnosa* is responsible for its behaviour.

Pure cultures of *M. damnosa* on wheat agar developed fertile perithecia after a fortnight but when grown with *F. culmorum* on potato dextrose agar, immature perithecia were present after barely seven days. Ascospores of *M. damnosa* failed to germinate without the stimulative action of *F. culmorum*. The conidia of *F. culmorum*, when sown near a growing culture of *M. damnosa*, germinated regularly, perithecia being produced at first along the line of contact and then on the aerial mycelium above both colonies. At no time was inhibition of *F. culmorum* observed.

Stevenson (F. J.). **New varieties of Potatoes.**—*Amer. Potato J.*, xxiv, 8, pp. 247–260, 1947.

The author summarizes the reports sent in by members of a committee appointed to assemble data on potato varieties grown and their performance in the United States [*R.A.M.*, xxvii, pp. 34, 37] and Canada. Since 1932, at least 34 new potato varieties have been distributed to growers in the United States. Judging by the amount of seed certified in 1946, Katahdin, Chippewa, and Sebago are the most widely grown of the new varieties, with 8,303,035, 1,799,378, and 1,619,098 bush. certified seed, respectively, in the United States and 2,424,779, 6,720, and 1,601,557, respectively, in the Maritime Provinces of Canada. There was, in fact, more certified seed of Katahdin produced in 1946 than of any other late variety, being surpassed only by Irish Cobbler.

W. C. Libby, reporting for New England, states that, locally, Katahdin has to some extent replaced Green Mountain and Irish Cobbler, because of its freedom from net necrosis [ibid., xxvi, p. 165] and because it is easy to grow and keep reasonably disease free. Chippewa is grown instead of Green Mountain in some sections because of its earliness and freedom from net necrosis and stem-end browning [loc. cit.]. Sebago is competing with Green Mountain because of its blight [*Phytophthora infestans*] resistance and freedom from internal discoloration. Houma also shows resistance to internal discoloration. Sequoia is increasing because of high yields and freedom from net necrosis. Mohawk resists mild mosaic [cf. ibid., xviii, p. 544], but has shown net necrosis.

J. C. Campbell states that in Indiana the Chippewa variety is susceptible to scab [*Actinomyces scabies*], leaf roll, and late blight in both vines and tubers. Sebago is resistant to scab and to late blight. Sequoia is susceptible to scab and to late blight rot in the tubers. Red Warba is susceptible to scab. In West Virginia, Sebago resists soil rots and late blight and Katahdin resists virus diseases. Mohawk is susceptible to ring rot [*Corynebacterium sepedonicum*: cf. ibid., xxiii, p. 271; xxvii, p. 37]. Pontiac is highly susceptible to scab. Potomac is less susceptible to soil rots than Sequoia. In Illinois, Sequoia shows a high incidence of hollow

heart [ibid., xxii, p. 76]. In Nebraska, Kasota is susceptible to leaf roll, spindle tuber [cf. ibid., xxvi, p. 165], and black leg [*Erwinia phytophthora*: cf. ibid., xxii, p. 174] but resistant to *Fusarium* wilt [*F. solani* var. *eumartii*: ibid., xxii, p. 448] and stem-end browning. In Ohio, Sebago shows considerable purple top [ibid., xxvi, p. 411], Chippewa much leaf roll, and Erie some internal browning, while Menominee is resistant to scab.

From Michigan, H. C. Moore reports that Russet Rural shows resistance to scab, though Chippewa is susceptible. Katahdin and Russet Rural are liable to hollow heart. Pontiac does not rot easily in wet soil or even when affected by late blight, but is very susceptible to scab. Green Mountain is susceptible to virus diseases, especially mosaic. Sebago is very resistant to deep scab and moderately so to late blight, but has been severely affected by black leg. Some growers state that Erie develops less scab than Chippewa and other white-skinned varieties. Menominee has shown hollow heart in some districts. It has more resistance to scab and late blight than Sebago. White Rural seems to be rather less resistant to scab than Russet Rural.

According to C. L. Fliтch, Sebago is on trial in northern Iowa because of its scab resistance. In Wisconsin, Chippewa showed susceptibility to scab and late blight, while Sebago is moderately resistant to late blight and yellow dwarf [ibid., xxvi, p. 313]. In Wyoming, Teton is resistant to ring rot [ibid., xxvii, p. 39].

Potatoes.—*Bull. Me agric. Exp. Sta.* 442, pp. 117–154, 1 fig., 1946.

R. Bonde, M. R. Harris, and D. Merriam report that until the new seedling potato varieties resistant to bacterial ring rot [*Corynebacterium sepedonicum*: *R.A.M.*, xxiii, p. 271; xxvii, p. 39] are available commercially, sanitation methods must be adopted to control this disease. According to R. Bonde there is a possibility that some of the copper fungicides can be used effectively as disinfectants by increasing the length of the treatment. The percentage of ring rot that developed was markedly less when the tribasic copper sulphate solution treatment was increased to 12 hours. In inoculation tests the variety President continued to be highly resistant to infection. Selections S824, S850, S870, and S47102 [ibid., xxvi, p. 166] showed very little ring rot infection. It is significant that many seedlings, such as 96–28, 96–44, 96–345, 336–18, 336–114, and President [ibid., xxv, p. 313], possess resistance to late blight [*Phytophthora infestans*] as well as to *C. sepedonicum*. Seedling 47102 has remained highly resistant to ring rot during extensive and rigorous trials conducted at Aroostook Farm for a period of six years. Green Mountain potatoes yielded at the rate of 451 bush. per acre compared with 492 for Seedling 47102.

M. R. Harris reports that ring rot can be eliminated by inspection. When two tuber lots of Spaulding Rose and one of Katahdin were examined for *C. sepedonicum*, only one Spaulding Rose lot was completely free from infection. From each lot 200 apparently healthy tubers were selected and stored for several months, and then planted during the 1945 season. No symptoms appeared either during the growing season or on the tubers at harvesting. The same author began a study in 1945 to determine if bacteria find their way into potato seeds, collecting and planting 132 seed balls from seedling plants and 68 from Katahdin plants. Altogether 62 of the resultant plants were selected as being most likely to develop ring rot on a basis of appearances. These weak, malformed, and often etiolated plants were surface-sterilized and plated. After several days' incubation several plants showed cultures of bacteria, 12 of which after testing with the Gram stain [ibid., xxi, p. 390] closely resembled ring rot bacteria.

D. Folsom reports that the spread of potato leaf roll was more severe in 1944 than in any year since the Highmoor Farm resistant variety tests [ibid., xxv, p. 573] were started in 1938. Green Mountains and Chippewa developed 91 and 93 per cent.

leaf roll, respectively, whereas the Highmoor Farm leaf roll resistant seedlings contracted little or none. Although one resistant parent in crosses gave fairly resistant progeny, the best results were recorded when two resistant seedling selections were used, the progeny contracting far less leaf roll than those from crosses made with foreign commercial varieties reported resistant. In comparing 17 Highmoor Farm leaf roll resistant seedlings with 17 Chippewa and Green Mountain plots on Aroostook Farm in 1945, D. Folsom and F. H. Steinmetz found that, as in 1944, only a few ranked with Chippewas and Green Mountains in average tuber weight. Only one seedling has commercial promise, being very similar to Chippewa but practically field-immune from leaf roll.

The natural field spread of leaf roll [ibid., xxiii, p. 75] in different varieties in Aroostook County in 1944 was studied by R. Bonde and G. W. Simpson as shown by the amount of disease present in the emerging plants in 1945. Irish Cobbler, Chippewa, Green Mountain, President, Harmony Beauty, and Katahdin developed 57, 92, 89, 99, 47, and 29 per cent. leaf roll, respectively, in 1945. The same authors infested seven named varieties and two unnamed seedlings with *Myzus persicae* [loc. cit.] which had been reared on potato plants infected with leaf roll. Katahdin was susceptible under the test conditions although normally resistant in the field. Teton, Pawnee, Houma, and Seedling 46952 appeared to be resistant, the progeny of the latter also possessing good resistance.

Single-tuber progenies of a number of crosses were planted in the field, the resulting plants being inoculated with viruliferous aphids reared on leaf roll plants. Those from Triumf selfed gave the best results, with approximately 46 per cent. of the seedlings free from leaf roll at the end of the second summer, and appear better commercially than Triumf for further breeding for leaf roll resistance. Differences were observed in the amount of net necrosis [usually attributed to leaf roll virus+virus A, but see ibid., xxvi, pp. 165, 412] developing in Green Mountain tubers, although the leaf roll readings were similar. At regular intervals throughout the 1944 season healthy Green Mountain plants were grafted with infected plants. The tubers from grafted plants were stored at 50° C. and the percentage developing net necrosis increased from 22, as the season for inoculation was advanced, to a maximum of 82 occurring in those grafted in mid-August. The data suggest that the irregularity in the amounts of natural leaf roll depends on the time when aphid infection occurs. A. F. Ross found in 1945 that although results were more erratic than in previous years, there was a definite tendency for leaf roll spread to be increased by raising the rate of fertilizer application and the proportion of phosphorus in the fertilizer. Plots receiving potassium chloride up to 1941 were given the sulphate instead and after three years the spread of leaf roll was reduced in most cases. The Highmoor strain of Green Mountain had greater leaf roll spread and a smaller net necrosis : leaf roll ratio than the Keswick strain, probably due to the slower emergence of the former.

T. E. Bronson, F. F. Smith, W. A. Shands, and G. W. Simpson superintended experiments in aphid control at Houlton, Maine, for a sixth season. It is now accepted that aphid control will result in substantial increases in potato yields, August being the critical period when incoming aphid carriers must be almost completely controlled if leaf roll is to be kept within bounds. DDT seems most effective against aphids when employed as an aerosol, a spray, or dust mixture. The co-operation of growers is required in purchasing good stocks, isolating fields producing 'seed' potatoes, roguing diseased plants, controlling aphids, and harvesting 'seed' stocks early, in order to accomplish the control of leaf roll.

A. F. Ross found that on Aroostook Farm, late planting resulted in more stem-end browning [ibid., xxvi, p. 119] in Green Mountains (but not in Irish Cobblers) than did early planting. Those lots of the Keswick strain (susceptible to stem-end browning) planted on 12th June uniformly gave the highest stem-end browning

readings but disease incidence appeared substantially different only among the earliest dug samples. Although in central Maine the date of harvest had very little effect on the amount of stem-end browning developing in storage, on Aroostook Farm tubers of both Green Mountain strains whose tops were dead on 5th September had the lowest incidence after storage.

G. P. Steinbauer found that cyanamide dust generously applied to refuse heaps of sprouting tubers in dry weather was an effective treatment for preventing the spread of *Phytophthora infestans*. Naphthas used as undiluted sprays, dow 66 improved at 3 in 100 gals., and weed-killer 75 (sinox general) [ibid., xxvi, p. 561] at 1 lb. herbicide with 3 gals. diesel oil per 100 gals. water, were all effective also when the heaps were drenched early and re-sprayed as long as sprouts emerged.

Tolaas (A. G.), Krantz (F. A.), Reddick (D.), Werner (H. O.), & Moore (H. C.). **Developments in Potato breeding.**—*Amer. Potato J.*, xxiv, 7, pp. 220–231, 1947.

This paper consists of summaries of talks given at the meeting of the Potato Association of America at Chicago on 2nd, 3rd, and 4th December, 1946. The material presented gives a clear picture of what has been accomplished by potato breeding in the United States in the last hundred years or so (reviewed by A. G. Tolaas), shows what is involved in adopting a new variety, and lists the methods for testing a new variety before it is issued to farmers.

F. A. Krantz, discussing the National Potato Breeding Program, stated that the sources of resistance to common scab [*Actinomyces scabies*: cf. *R.A.M.*, xxiv, p. 247] were the German varieties such as Jubel, Hindenburg, and Arnica. Many of the best selections from initial crosses with the best American varieties showed high scab resistance and some showing promising commercial characters have been named and introduced. These were then crossed with each other and with unrelated superior commercial types, and selections from this second round of crosses are at present being tested [see above, p. 85].

Breeding against late blight [*Phytophthora infestans*: cf. ibid., xxv, p. 313] has already passed the experimental stage, and resistant varieties suitable for commercial production are being developed.

Beaumont (A.). **The dependence on the weather of the dates of outbreak of Potato blight epidemics.**—*Trans. Brit. mycol. Soc.*, xxxi, 1–2, pp. 45–53, 1947.

A detailed study of the meteorological data recorded at Seale-Hayne Agricultural College from 1929 to 1939, in relation to outbreaks of potato blight [*Phytophthora infestans*: *R.A.M.*, xvi, p. 514; xxvi, pp. 26, 210], has shown that, although the Dutch rules [ibid., v, p. 628] governing the date of blight outbreak can also be applied to south-west England to a certain extent, in Devon they tended to forecast blight earlier than it eventually appeared. Excluding 1931, when blight appeared inexplicably early in June, and considering only the July and August weather data the disease was found to follow the first critical date within 15 and 22 days in three and six seasons out of ten, respectively. Using the temperature-humidity rule [ibid., xvi, p. 514], which gives good results in Devon and Cornwall, blight followed the first critical dates within 15 and 22 days in three and five seasons out of 11, respectively. Excluding 1931, and considering only the July and August weather records blight followed the first critical period within 15 and 22 days in four and seven seasons out of ten, respectively. In the remaining three seasons there was no critical period and the outbreak was very slight. The temperature-humidity modification of the Dutch rules is regarded as being more practicable for forecasting purposes in this country.

he measurement of Potato blight.—*Trans. Brit. mycol. Soc.*, xxxi, 1–2, pp. 140–141, 1947.

The method of measuring potato blight [*Phytophthora infestans*] on the foliage [*R.A.M.*, xxiii, p. 140] has been found satisfactory after tests over several seasons. he finally revised form of the assessment key is given and includes two additional ategories, viz., 5 per cent., where about 50 spots per plant are present or one aflet in ten is attacked, and 95 per cent., where only a few leaves but most of the ems are still green. An additional symbol *pf*, representing damage in the area f the primary foci of the disease where the disease is usually more advanced, may e used for additional accuracy in the early stages of an epidemic. This method ives a fairly accurate measure of the percentage of leaf area destroyed. Accurate ercentage estimates of tuber damage can be obtained by the counting of random amples in the soil or in clamps.

Vilson (J. W.) & Sleesman (J. P.). **The differential response of Potato varieties to spraying with DDT plus a fixed copper.**—*Amer. Potato J.*, xxiv, 8, pp. 260–266, 1947.

In an experiment, carried out in two localities in Ohio, in which three standard prays (Bordeaux mixture 8–8–100, COCS (copper oxychloride sulphate) 4–100, and erlate 2–100), each with 1–100 DDT, were compared on Irish Cobbler, Katahdin, nd Erie potatoes, Katahdin showed the greatest increase in yield as a result of the reatments. Zerlate gave the best control of early blight [*Alternaria solani*], but was ess effective than the other two materials against late blight [*Phytophthora infestans*]. COCS and Bordeaux mixture gave about equal disease control in both localities.

Ruehle (G. D.). **Recent spray tests for control of Potato late blight in sub-tropical Florida.**—*Amer. Potato J.*, xxiv, 9, pp. 299–307, 1947.

Comparative spraying tests carried out at Homestead, Florida, over three seasons n the control of late blight (*Phytophthora infestans*) [*R.A.M.*, xxvi, p. 147] on Bliss Triumph potatoes showed that the most reliable spray treatment was dithane–inc sulphate–lime ($1\frac{1}{2}$–1–$\frac{1}{2}$). It also controlled early blight (*Alternaria solani*) very ffectively. When properly mixed and used at weekly intervals it causes no visible njury to the foliage. In Florida, injury may occur if lime is omitted, if neutralized inc is substituted for zinc sulphate–lime, or if the applications are made at intervals f four or five days. The injury caused by the more frequent applications is, how-ver, less severe than that following copper fungicides applied at the same intervals. Dithane–zinc sulphate–lime is compatible with DDT, and the combination shows romise as an effective fungicide-insecticide.

Copper sprays or dusts still have a place in southern Florida. Much of the soil s deficient in copper or so alkaline that copper becomes immobilized when applied o the soil as a fertilizer. A single copper spray or dust will supply this element, nd in most seasons may be applied before blight becomes a serious problem.

Bhagwagar (P. R.). **Early blight of Potato in India.**—*Indian J. agric. Sci.*, xvi, 3, pp. 296–301, 1946.

Isolations were made from potato leaves infected with early blight (*Alternaria olani*) originating from Ootacamund, Naini, Pusa, and Simla. The long, beaked, bclavate spores of the Simla strain were typical of the species and the cultures ere chromogenic. The other isolates produced small, short, beakless, longi-udinally septate spores. They were non-chromogenic on oatmeal and potato extrose agars, but partially chromogenic on steamed rice. Symptoms and athogenicity tests indicate that the Simla strain is highly pathogenic, while

the other strains are weak parasites. It is concluded that in addition to *A. solani*, another species is associated with early blight in India.

MÜLLER (K. O.). **Über die Schadwirking der Rhizoctonia solani K. bei der Kartoffel.** [On the injurious effect of *Rhizoctonia solani* K. on the Potato.]—*NachrBl. dtsch. PflSchDienst*, N.F., i, 3, pp. 47–51, 2 graphs, 1947.

During the autumn of 1943 the writer was much impressed by the varietal differences in the reaction of potatoes to *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xxvi, p. 26], as reflected in the yields harvested at a Pomeranian station formerly in charge of the Biological Institute. Weather conditions during the year appeared to be particularly favourable to the pathogen, and in extreme cases infection on commercial varieties was of unprecedented severity. Large-scale experiments (on which it is proposed to report more fully later) were accordingly carried out in 1944 to determine the factual basis for the observed variations in response to the disease and the possible existence of strains of differing virulence pointing to physiologic specialization within *C. solani* [cf. ibid., xxvi, p. 508].

Cultures of isolates 13 and 33 of the fungus were applied to sclerotium-free tubers of the Konsuragis, Erika, Carnea, Frühmölle, and Erdgold varieties and selections 5 31, 6 33 (Aquila), and B97, weighing 60 gm. each, planted at two depths, 6 and 14 cm., before covering them with soil, each plant hole being dusted with 12 gm. of the superphosphate containing preparation P (I.G. Farben) [ibid., xxvi, p. 27] to eliminate fungal contaminants from the rhizospheres. Significant differences between the plants arising from the inoculated tubers and those of a parallel series of controls were already apparent at emergence. For instance, the number of tubers germinating by 7th June per 15 inoculated and clean tubers of Frühmölle planted at 14 cm. were 4 and 10, respectively, and per 12 tubers at 6 cm. 8 and 11, respectively, and the average numbers of stems per plant in the deep-planted plots 1·7 and 3·3, and in the shallow 2·9 and 3·4, respectively. In the case of 6 33 (Aquila), the 15 inoculated and 15 clean tubers at 14 cm. produced 7 and 14 plants, respectively, the corresponding figures at 6 cm. (12 tubers each) being 12 and 12, respectively, while the average number of stems per plant in the deep- and shallow-planted plots were 3 and 5·1, respectively, for the inoculated and 5·1 and 5·6 for the clean tubers. Not only did Frühmölle, as shown by these figures, sustain heavier pre-emergence losses than 6 33 from infection by *C. solani*, but the plants of the former variety were more or less severely stunted while those of the latter made reasonably satisfactory growth, the difference in this respect persisting until the time of flowering. From an analysis of the yield data for Frühmölle, Erdgold, 5 31, and 6 33 the average loss from the disease in the shallow-planted plots was computed at 15 per cent. and in the deep-planted at about 30 per cent. On the basis of observations made in recent years the author does not hesitate to assign to *C. solani* a much higher proportion of yield reductions than are commonly referred to this cause: for Pomerania, where the cool May and June weather is particularly conducive to infection, he estimates the reduction at a minimum of 5 per cent.

BEAN (J. L.). **Eumerus strigatus reared from decayed Potatoes.**—*J. econ. Ent.*, xl, 3, pp. 452–454, 1947.

In October, 1945, upwards of 100 potato tubers from a farm at Mars Hill, Maine, were found to be heavily infested by dipterous larvae, which on emergence between the end of March and end of June following were identified as *Eumerus strigatus* (Syrphidae). The insects had bored irregular cavities in the epidermis of the tubers, through which a number of soil-inhabiting pathogens had gained ingress, including *Fusarium* spp. (mostly of the wet-rot type) and the agent of blackleg [*Erwinia phytophthora*]. This is believed to be the first record of *Eumerus strigatus* on

otatoes in the United States, and its economic importance can only be established y a study of its relation to the rots affecting the crop.

TARR (G. H.). **Steam sterilization to kill Potato ring-rot bacteria on burlap bags.**—*Amer. Potato J.*, xxiv, 7, pp. 231–233, 1947.

Tests conducted in 1945 and 1946 to ascertain how much steam sterilization was ecessary to rid 100 lb. burlap bags of the potato ring rot organism [*Corynebacterium :pedonicum*: see above, pp. 85, 86] indicated that the minimum requirements are, or 10 bags loosely rolled, 5 lb. pressure, 20 to 30 minutes, or 10 lb. for 20 minutes, 0 bags tightly rolled, 5 lb. for 30 minutes, or 10 lb. for 20 minutes.

ASUDEVA (R. S.) & RAMAMOORTHY (C. S.). **Studies on the virus diseases of Potatoes in India. III. Occurrence of Solanum virus 3 Murphy and M'Kay.**—*Indian J. agric. Sci.*, xvi, 2, pp. 206–208, 5 figs., 1946.

During the course of investigations on the incidence of virus diseases of potatoes *R.A.M.*, xxvi, p. 75] at the Imperial Agricultural Research Institute, New Delhi, otato virus A was recovered from Phulwa and Darjeeling Red Round potatoes. he first variety exhibited yellowing of the leaf margins or a brilliant deep yellow ottle, the second extreme leaf crinkling. Plants with four different types of ymptoms were tested by inoculation and their reactions on differential hosts ndicated that virus A was present in all plants.

Phulwa plants which exhibited yellow spots after several weeks' growth also ontained a weak strain of virus X. The presence of a weak strain of this virus as also suspected in Darjeeling Red Round. Virus Y was detected in Phulwa lants showing marginal or complete foliar yellowing and necrotic spots.

LODGETT (E. C.) & NIELSEN (L. W.). **Fasciation in Russet Burbank Potatoes.**—*Phytopathology*, xxxvii, 8, pp. 597–600, 2 figs., 1947.

During a survey of Idaho potato cellars in 1944 occasional specimens of Russet Burbank were observed with a peculiar symptom to which the name of 'stitched nd' was applied. The terminal buds were fused, the apical end bearing constric- ons and ridges at irregular intervals, giving the appearance of a tightly sewn grain ag without ears. Severely affected tubers tend to become wedge-shaped and in xtreme cases the flattened tubers show cleavages of varying depth extending from he bud end towards the stem end. The apical buds of affected tubers appear to e small and shallow, with a tendency to precocious sprouting.

A number of 'stitched end' tubers collected from several lots in 1944 were grown n the two following years in plots at the Aberdeen Branch Experiment Station. hey gave rise to plants with flat or ribbon-like stems, up to 1 in. or more wide, ut all stems from a hill were not fasciated. The stem apex may curve downwards. ompletely fasciated stems may be abnormally short, though some measured 29 in. bove soil-level. Branching also varies widely and irregularly. Fasciated stems ay branch dichotomously or into one or more normal or flattened laterals. Leaves ubtending lateral branches may be missing and are often out of natural position. asciation may likewise involve the petioles and peduncles.

This is believed to be the first record of fasciation in potato tubers and plants. he condition is tentatively attributed to a genetic disturbance perpetuated in ffected stock rather than to a virus of the degenerative type, since there is no ecline in plant vigour or tuber development through successive generations. owever, there is observational evidence for the masking of fasciation by spindle uber [*R.A.M.*, xxvi, p. 165].

During the last two years the junior writer has found six affected plants n commercial fields. Its total elimination from a seed stock would be almost

impracticable, since many tubers carrying the factor are symptomless, while abnormal pieces do not necessarily produce fasciated plants.

FOLSOM (D.). **Inheritance of predisposition of Potato varieties to internal mahogany browning of the tubers.**—*Amer. Potato J.*, xxiv, 9, pp. 294–298, 1 fig., 1947.

Data obtained in the routine testing for predisposition to internal mahogany browning [*R.A.M.*, xxi, p. 302] of new seedling potato varieties resistant to the natural spread of leaf roll are presented. One series from the 1943 crop was stored at 32° F. for several months in an experimental potato storage, while another series, from the 1946 crop of other seedling varieties, was stored at about 31° for six months in a commercial apple storage.

The results showed that at 32° X750–10 (Imperial × Katahdin) and Chippewa are more predisposed to the condition than X1276–48, X1276–185 (both derived from Houma × Katahdin), X247–48 (Kepplestone Kidney × Earlaine), and Green Mountain. At 31° X1276–185 joins Chippewa, and Green Mountain more nearly approaches it, whereas Katahdin is more predisposed than Chippewa. The difference between X750–10 and X1276–48 is reflected in the hybrids B410 and B420, derived from the two former each crossed with X247–48. In B410, which has the more predisposed parent, the percentage of affected tuber flesh was much higher and the predominant or average type of injury much more severe. In the crosses between X247–48 and commercial varieties less predisposition was generally transmitted to the seedlings than in hybrid B410. In some crosses the extent of injury ranged from 0 to 100 per cent. as between seedlings.

It is concluded that mahogany browning varies from one commercial or seedling variety to another, the relative amount of injury as between varieties may change with the storage temperature, and the proper selection of parents is helpful in developing varieties resistant to the defect.

MARTIN (W. J.). **Alternaria leaf blight of Hevea Rubber trees.**—*Phytopathology*, xxxvii, 9, pp. 609–612, 2 figs., 1947.

One out of over 130 *Hevea* rubber clones, GA–1279, in an experimental planting at El Palmar, Veracruz, Mexico, was largely defoliated in April, 1946, by a blight due to a species of *Alternaria* [*R.A.M.*, xxvi, p. 417] apparently distinct from any described by Groves and Skolko [ibid., xxvi, p. 405] or Neergaard [ibid., xxv, p. 579]. Leaves shed at an early stage of development present a scorched appearance, while those reaching maturity may show brown, concentrically zonate, interveinal spots or somewhat elongated lesions along the main veins, often accompanied by necrosis of the distal portion.

On the host sporulation was moderate to abundant; the conidia [figured with beaks nearly as long as the spore body] were 50 to 106 by 10 to 17 μ, with 3 to 9 transverse and up to 3 longitudinal septa, and the conidiophores, 50 to 200 by 4 to 6 μ. The fungus grew readily on potato dextrose agar, producing a grey, flocculent mycelium but no spores: on transference to plain water agar a few conidia were produced in five to ten days. Inoculations on three- to four-day-old leaves of the susceptible clone resulted in the development of typical blight symptoms within six days, but no infection took place even on wounded foliage over ten days old. Infestation by the Homopteron, *Tomaspis inca*, was found to aggravate the disease on GA–1279 and to permit of its occurrence on the otherwise immune GV–12.

MADER (E. O.). **A corrective measure for 'soil sickness' occurring in sand media.**—*Phytopathology*, xxxvii, 9, pp. 682–683, 1947.

Some of the investigations on 'soil sickness' reported in this paper were carried out in Germany, where the condition is known as 'Bodenmüdigkeit' [soil exhaus-

on], and the others in Ohio. When roses are grown for some time in sand or ravel culture, the plants eventually sicken, the roots die, and flower production eclines. Chrysanthemum cuttings rooted for two to three years in the same sand ecome stunted, make little or no growth, and sometimes die. At irregular intervals he roots darken and begin to disintegrate, and rust-coloured lesions very often ppear, resembling those caused by soil-borne pathogens. The roots frequently il to develop or remain short, thickened, and gnarled. As soon as new roots are rmed, they darken and die. The lesions yielded no organisms, and the bacteria nd fungi isolated from the surrounding medium did not prove pathogenic in noculation experiments.

The best means of correcting the trouble was by replacing the 'sick' by new sand, ut this measure entails considerable expense for large areas. Satisfactory results ere obtained by treatment of the sand with 1 per cent. sulphuric acid, used at he rate of 5 gals. per 20 sq. ft. of bench space with a depth of 4 in. Transferred o treated from 'sick' sand, chrysanthemum plants recovered completely and rmed sound new roots. Conversely, those grown in the treated and removed to sick' sand succumbed to the disorder. It was found that the sulphuric acid could e applied to the sand without the removal of the plants, if they were surrounded y asphalt-coated, tin collars. Shortly after the withdrawal of the latter, new, ealthy roots invaded the treated sand. The use of oats as test plants showed that sick' sand stunted the growth of seedlings without causing visible root injury, hile in the treated sand development was apparently normal.

Hewitt (E. J.). **The resolution of the factors in soil acidity: some effects of manganese toxicity.**—*Rep. agric. hort. Res. Sta. Bristol, 1946*, pp. 50–61, 1 pl. [? 1947.]

This is a further study of the effects of manganese sulphate in concentrations anging from 0·8 to 24 milli-equivalents per l. (22 to 660 p.p.m.) of manganese and hree levels of calcium on 16 different crop plants grown in sand cultures [*R.A.M.*, xv, p. 577]. Excess manganese produced in savoy cabbage symptoms identical vith those appearing in plants growing in acid soils as a marked cream or green-hite chlorotic rim round the margin of the older leaves. Calcium deficiency and nanganese toxicity produced in swedes cupping, distortion of young leaves, and ntervenal grey tinting, necrosis and wilting of older leaves, and a chlorotic rim ffect and scorching, symptoms similar to those observed in swedes growing in acid oils. The characteristic symptoms of potatoes growing in acid soils resemble closely hose produced by a combination of calcium deficiency and excess manganese or y acute calcium deficiency alone. 'Central necrosis' has been noticed on potatoes rowing on unlimed, potash-free, and highly acid soil (pH 3·9) and was reproduced n culture by omission of calcium and potassium coupled with excess manganese. The detailed visual symptoms are given in a six-page appendix.

Manil (P.). **Quelques essais microbiologiques d'appréciation de la fertilité du sol.** [Some microbiological experiments in the estimation of soil fertility.]—*Bull. Cl. Sci. Acad. Belg.*, Sér. 5, xxviii, 7–9, pp. 676–710, 6 graphs, 1942. [Received 1947.]

A detailed account is given of the author's experiments at the Gembloux Agronomic Institute on the application of the microbiological method to the estimation of soil fertility in potato, sugar beet, and bean [*Phaseolus vulgaris*] plots amended vith potash and phosphorus, using *Aspergillus niger* [cf. *R.A.M.*, xviii, p. 241] in 4 and *Cunninghamella elegans* in six. The procedure was found to be more reliable, when compared with the results of chemical analysis, in respect of available phosphorus than in that of potash, for which *C. elegans* in any case should not be used.

VERONA (O.). **Sulla presenza e numero degli Actinomiceti nel terreno agrario in rapporto alle diverse stagioni dell' anno.** [On the presence and number of Actinomycetes in agricultural soil in relation to the various seasons of the year.]—*Mycopathologia*, iv, 1, pp. 48–53, 10 graphs, 1947. [German, Spanish, English, and French summaries.]

Observations made during investigations at the Institute of Agricultural Microbiology of the University of Pisa into various Italian soils showed that in these the number of Actinomycetes present tended to reach a maximum during autumn.

KEYWORTH (W. G.). **Verticillium wilt of the Hop (Humulus lupulus).**—*J. Pomol.*, xxiii, 1–2, pp. 99–108, 2 pls., 1947.

Continuing his studies on *Verticillium* wilt of hops (*V. albo-atrum*) [*R.A.M.*, xxvi, p. 468], the author gives the results of the primary selection trials and small-scale commercial tests with wilt-resistant varieties.

In 1943 one-year-old Wye plants [ibid., xxiv, p. 205] were grown on plots inoculated by the addition of diseased hop bines collected in the previous year. Thirty-six plants of each of the 31 test varieties were grown in trenches (8×9 in.) spaced 4 ft. apart, to which the inoculum (1 bush. per 20 ft. row) was added in March. All but eight plants grew vigorously for about eight weeks, after which the first wilt symptoms appeared on the susceptible Fuggles plants grown as indicators. The final examination of the plants at the end of September showed that no variety was immune. OR55, AOO10, AEE55, OB53, 219, and 1147 showed no or slight symptoms only but 18 out of 82 apparently healthy bines of the three first-named developed conidiophores of *Verticillium* on incubation in the laboratory, thus indicating symptomless carriers.

In the 1944–46 experiments the same plots were used again, the rows being evenly re-inoculated each season. The varieties showing least wilt (0 to 10 per cent.) were AOM47, EE29, OM103, and XIII in 1945, and AOM47 and OR55 in 1946.

Resistant varieties were then tested in small-scale commercial trials on a number of farms. Bedded sets were planted in severely infested spots where mature wilted plants had been carefully grubbed and the soil replaced. At one farm OB53 and 1147 remained free from external symptoms for three years in soil in which wilt appeared in almost all the Fuggles and Tutsham showed no marked resistance. In September, 1943, *V. albo-atrum* was isolated from 11 plants of the 39 OB53 plants grown, all 11 showing brown wood in their bines. Two OB53 plants showing wilt symptoms in 1944 were symptom-free in 1945. A two-year trial at a second farm demonstrated the high resistance of OB53 and AEE55 in an area in which all the Fuggles were severely infected, the latter variety remaining wilt-free on three other farms where both OR55 and AOO10 were attacked, though less severely than Fuggle. Further trials during 1945 and 1946 confirmed the high resistance of OB53 and also of the bud sport OM26. The varieties 219 and 1147 were also highly resistant. Crop records in 1946 were as follows: OB53 yielded 10¼ cwt. per acre, OM26 11¼, 219 16¼, and 1147 13¼, in comparison with Fuggle 4. It is concluded that the varieties OB53, OM26, and AEE55 are highly wilt-resistant, 219, 1147, and OR55 moderately so, and AOO10 of low resistance only.

CHOWDHURY (S.). **Effect of manuring on the sclerotial wilt of Pan (Piper betle L.).**—*Indian J. agric. Sci.*, xvi, 3, pp. 290–293, 1946.

The field selected for these manuring tests at Sylhet, Assam, was one on which all *Piper betle* plants had been killed by sclerotial wilt (*Sclerotium rolfsii*) [*R.A.M.*, xxv, p. 44 and next abstract] and to the soil of which additional infective material was added. All subsequent deaths of plants were due to *S. rolfsii*. Applications

of mustard oil cake, ammonium sulphate, sodium nitrate, and ammonium phosphate reduced considerably the mortality percentage, all being equally effective. The death-rate was found to be related to the amount of nitrogen applied, the type of nitrogen having little effect. In 1943, at 50 lb. nitrogen per acre, an average of 9 per cent. deaths occurred after the application of each of the four manures (control 27·43 per cent. deaths), and 7 per cent. in 1944 (31·9); at 100 lb. there were 4 and 3 per cent. deaths in the two years and at 200 lb. only 2 per cent. These treatments also increased the yields.

CHOWDHURY (S.). **Effect of hydrogen-ion concentration on the growth and parasitism of Sclerotium rolfsii Sacc.**—*Indian J. agric. Sci.*, xvi, 3, pp. 293–296, 1 graph, 1946.

The effect of hydrogen-ion concentration on the growth and parasitism of *Sclerotium rolfsii* [see preceding abstract] was studied at the Plant Pathological Laboratory, Sylhet, Assam. In modified Richards's solution with 2·5 per cent. agar added the fungus grew over a wide range of pH, 6·4 being the optimum for growth and sclerotial formation. Examination of local soils from many healthy and infested fields showed no marked difference in pH values. No correlation appeared to exist between the hydrogen-ion concentration of the soil and the incidence of the disease.

MAIRE (R.) & POLITIS (J.). **Fungi hellenici. Catalogue raisonné des champignons connus jusqu'ici en Grèce.** [Hellenic fungi. An analytical list of the fungi hitherto recognized in Greece.]—*Act. Inst. bot. Univ. Athènes*, i, pp. 27–179, 1940. [Received December, 1947.]

In this list of 1,323 fungi collected in Greece [cf. *R.A.M.*, xvi, p. 838; xviii, p. 10] are a number of well-known plant pathogens, including *Spongospora subterranea* on potato, *Urocystis tritici* on wheat, *Puccinia antirrhini* on *Antirrhinum majus*, *Bacterium* [*Xanthomonas*] *malvacearum* on cotton, *Piricularia oryzae* on rice, and *Phytophthora parasitica* var. *capsici* n. comb. [*P. capsici*]. The last-named, isolated from chilli plants suffering from collar rot [ibid., xvi, p. 833], is responsible for heavy damage to the crop.

MARTIN (J. P.). **Pathology.**—*Rep. Hawaii Sug. Exp. Sta., 1945–6* (ex *Printed Reps. Hawaii Sug. Pl. Ass., 1946*), pp. 27–36, 1946.

In this report [cf. *R.A.M.*, xxv, p. 523] it is stated that as Fiji disease [ibid., xxvi, p. 263 and next abstract] occurs in Samoa, where environmental conditions favour spread, sugar-cane varieties of commercial promise propagated in Hawaii are to be tested against the disease in Samoa. Information concerning the reaction of local sugar-cane varieties to a foreign disease is essential in case the disease enters Hawaii. Dr. H. L. Lyon and W. W. G. Moir found Fiji disease causing little damage in Fiji [ibid., xxv, p. 141].

Investigation of a highly destructive disease of cactus (*Opuntia megacantha*) on Maui, associated with a soft rot of the 'pads', led to the isolation from diseased material of a bacterium and a *Fusarium*; these organisms proved to be pathogenic when inoculated into healthy plants in the laboratory and the field. In certain parts of Maui where the cactus is used as cattle feed in dry weather the disease is a serious matter. Control measures are being studied, but unless a resistant strain of cactus is developed there seems little likelihood of success. The two isolates from the Maui material may prove useful in Hawaii, where cactus is being successfully exterminated by inoculations with *F. oxysporum* [ibid., xxv, p. 524].

One case of smut (*Ustilago zeae*) [*U. maydis*] on the maize variety Hawaiian Sugar was reported; in Hawaii, the disease is very rare.

In recent years, 32–8560 and 32–1063 [ibid., xxiii, p. 288] have become the leading commercial sugar-cane varieties. They are very highly resistant to gumming [*Xanthomonas vasculorum*], leaf scald [*X. albilineans*], and root rot [? *Pythium graminicola*: ibid., xxv, p. 524], moderately so to brown stripe [*Cochliobolus stenospilus*: ibid., xxiii, p. 288] and chlorotic streak, and immune from mosaic but susceptible to Fiji disease. Uba and 31–1389 are highly resistant to eye spot [*Helminthosporium sacchari*], 31–2484, POJ 2878, and POJ 36 to leaf scald, 28–4291 to chlorotic streak, and 31–1389, POJ 2878, and POJ 36 to mosaic. POJ 36 is also highly resistant to gumming and Fiji disease.

D. M. Weller describes the results of a histological and cytological study of Fiji disease, stem and leaf galls produced by injections made by Martin with sodium naphthaleneacetic acid, *p*-chlorophenoxyacetic, and trichlorophenoxyacetic acid, and of chlorotic streak disease. While these galls may sometimes resemble externally those due to Fiji disease the histological pictures are entirely different. Fiji disease galls always contain X-bodies, which were not found in the artificially produced galls. Chlorotic streak induces no galls but some of its cytological effects resemble those of Fiji disease; for example, clusters of crystalline precipitates are found in the leaf epidermis with apparently normal nuclei. Such clusters of precipitates are considered to indicate the presence of a virus disease. In addition, what appeared to be other types of foreign bodies were also found in sugar-cane material affected by chlorotic streak. Anatomical correlation also appears to exist between stems bearing chlorotic streak lesions and those attacked by mealy bugs (*Trionymus sacchari*).

The 'Quick decline' Quarantine Regulation.—*Calif. Citrogr.*, xxxii, 5, pp. 206–208, 1 map, 1947.

This is a revision of Quarantine Regulation No. 8, concerning the virus disease now referred to as 'quick decline of orange trees' instead of 'citrus'. Sweet orange rootstocks used solely as such for species of *Citrus* other than *C. sinensis* are exempted from regulation. Parts of the counties of Los Angeles, Orange, Riverside, and San Bernardino are included in the area under quarantine from which the movement of sweet orange trees and propagative parts thereof is prohibited.

Distribution maps of plant diseases.—Maps 121–144. Issued by the Imperial Mycological Institute, 1947. 3*s.* 0*d.*

The sixth year's issue of this series of maps showing the world distribution of major crop diseases [*R.A.M.*, xxvi, p. 32] comprises (No. 121) *Gymnosporangium clavipes* on apple and juniper, (122) *Corticium salmonicolor* on *Hevea* rubber and other plants, (123) *Gymnosporangium globosum* on pear, quince, apple, and junipers, (124) *Oospora citri-aurantii* on *Citrus* spp., (125) *Elsinoe fawcetti* on *Citrus* spp., (126) *Diaporthe citri* on *Citrus* spp., (127) lucerne witches' broom virus on lucerne, (128) *Neofabraea malicorticis* on apple and pear, (129) *Pseudopeziza medicaginis* on lucerne, (130) *Urophlyctis alfalfae* on lucerne and *Medicago* spp., (131) *Erwinia phytophthora* on potato, (132) *Pseudomonas mors-prunorum* on plum, cherry, etc., (133) *Xanthomonas juglandis* on walnut, (134) *Pseudomonas fraxini* on ash, (135) *Pseudomonas savastanoi* on olive, (136) *Xanthomonas campestris* on cabbage and other crucifers, (137) *Bacterium tumefaciens* on apple, cherry, plum, etc., (138) *Xanthomonas solanacearum* on potato, tobacco, tomato, etc., (139) *Stemphylium sarciniforme* on clover, (140) *Bacterium rhizogenes* on apple, (141) *Pyrenopeziza medicaginis* on lucerne, (142) *Ceratostomella paradoxa* on pineapple, sugar-cane, banana, etc., (143) *Armillaria mellea* on various hosts, (144) tobacco ring spot virus on tobacco.